COAL AGE

Vol. 2 NEW YORK, SEPTEMBER 7, 1912 No. 10

"Hi dar mule! June erbout!
Cars ob coal need hauling out!
Boss man cussing mighty heap!
Claim yo' mules can't earn yo' keep!"

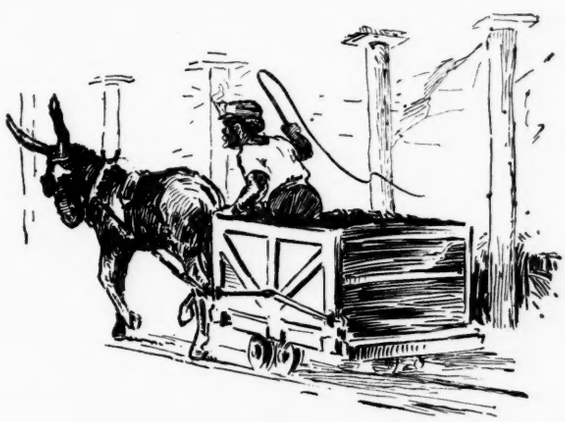
Jim the colored driver repeated this refrain six times between the room mouth and the locomotive gathering track. To render the "June erbout" impressive, he cracked his whip twice, and to emphasize the "Boss man cussing" he lambasted the mule with a chunk of coal.

And why did Jim exert himself thus unduly?

The general manager of the group of coal mines to which Jim and his mule looked for rations had pondered several days over his most recent digest of monthly cost sheets. For nearly a year these costs had been steadily climbing, and now in spite of all of his efforts the figures showed that the mining charges for the month just closed were the highest of the year. A most disquieting revelation, to say the least!

What could he, should he do?

Call in his subordinates and tell them a few things? Certainly!



Early the following day the superintendents assembled in the manager's office and he explained to them the weak points as they appeared to him from his point of view. He assured them that personally they were doing all right, but the men under them required a "jacking-up."

On the following day each one of these superintendents had a "heart to heart" talk with the mine foremen and under bosses in their employ.

Later in that same day these foremen and underbosses relieved themselves in terms easily understood by "day men" and drivers.

A little later in the day the drivers passed on the message delivered to them, as they understood it, much after the manner of Jim already quoted. Some of the drivers may have omitted the poetry, but that each and every mule received a look or a "chunk" that day, you need not doubt; and so, if you'll pardon the pun, the manager succeeded in stirring up the animals.

Did the costs for the ensuing month improve? They did not! The manager in his talk with the superintendents had impressed upon them the necessity of getting in closer touch with the men under them, and insisting that better results be forthcoming. That sort of talk and its reception by the superintendents while in his presence had convinced the manager, unconsciously perhaps, that the burden of the responsibility for the high costs was not on his shoulders, but was now in the hands of the ones who understood what was required. As soon as the superintendents had departed, he lighted a fresh cigar (a much better one, I'm sure, than the ones smoked by the superintendents during their confab that day) and smiled sweet smiles as he recalled his cleverness in handling his men.

The superintendents talked to the foremen and under bosses, using expressions quite similar to those impressed upon them by the manager, and were then relieved in their own minds of most of the responsibility much as the manager had been, and were now free to take up their interrupted dreams of profitable coal mines and the halcyon days when they would be sitting at the desk of the "big boss." Then the foremen passed the message down to the drivers in a way that made it plain that more coal must be forthcoming. The drivers, as before mentioned, put it up to the mules, using language impressive to such animals.

The mules not being able to talk, could neither pass the responsibility on down, nor buck and start it back up the line, and so were compelled to accept it. So long as they recalled the lash they picked up their ears and moved nervously. But—how long should a mule remember a lash and a piece of poetry?

Moral: *An organization that is developed to such a high state of perfection that every halt in efficiency can be traced down to the mules, needs a mule for its head.*

[Written for "Coal Age" by H. S. Geismer, Birmingham, Ala.]

Ideas and Suggestions

Interesting Talks Submitted in Response to Our Recent Request for Forewords.

Company Schools for Mine Employees

BY ANTHRACITE READER

The coal in the anthracite region is mined mostly by large corporations which could well afford to inaugurate some comprehensive scheme for educating their employees. And in that scheme could well be merged those smaller companies which operate in close proximity to the larger.

For this reason, I would advocate the formation of "Company Night Schools" for employees only. Perhaps it would not be possible and I would not adjudge it well, to compel an attendance at such schools. The employee would find such compulsory work a labor to be shirked rather than a pleasure to be enjoyed and so the idea would arise that as the attendance at school was not free and optional, the reward for it should be pecuniary and the payment enforceable by law.

But the school could be given some status by making all promotions wait on merits obtained by attendance and on scholarship as exhibited at the school. In fact such a merit system might not be purposely established, but it would inevitably arise wherever a keen management was looking for good and capable men. This, to my mind, would make all the younger employees join the school.

The usual question is answered here before the reader can propound it: "Why do we not leave the problem to the public schools?" The answer is not mine, but that of the working men themselves. They do not take kindly to the public schools and there is even some reticence in regard to private educational institutions like the Y. M. C. A.

In the company school, boys and men working in the same mine will be together. If going to school suggests that they are "just kids," then the uniform appearance of a large number of brawny men and wage-earning youths studying together will confute the false estimate. There is a power in *camaraderie*. The men who work together will study together, will understand each other and the humiliation of entering school at a ripe age will be forgotten.

The idea that only those whose muscles are not hardened for work or the fight should condescend to study under the direction of another is a foolish concept which, however, is nevertheless hard to remove and there are lots of young men around the mines who want to go to school and yet would blush to sit themselves down in the same seats and be taught by the same thin pedagogue who teaches during the day "our Jimmy and Billy and Harry."

Besides, the company school should hold sessions only twice or three times a week. A man who works hard needs a few days to himself; the youth has a vision and the older man a baby or two and neither will study five nights in one week.

And having these schools, let the superintendents control them, visit them frequently during their sessions and keep them up to the proper standards and they will find that from the schools will come better types of working men, more efficient labor, fewer accidents and saving in cost.

The ignorant laborer is an expensive hireling. We lower our ideals constantly to suit him. Our 100 per cent. efficiency is based entirely on what one can expect from such men as we have. With company schools and a new spirit, a new standard of human achievement will take the place of our present modest evaluation. The past though filled with brute strength has been more plainly marked by brute awkwardness.

A Poor Hand with a Pair of Jacks

By J. B. McDermott*

There is no question but that our mines are full of incompetent men. If that were once acknowledged and duly provided for, we might have safer operation because the men so labelled are not necessarily ignorant, lazy or unwilling; they are only not competent. They may be highly adaptible, but when hired they are indiscriminately placed.

After a few hours of coaching. they have mastered a series of questions and answers and can recite their little piece:

Are you a miner? Yes, mister boss.

Where did you work in the mines? Penns'vania, one year, Colorad' two years, Wyomin' one year.

Ever use black powder? Well, yes, you bet he did if he ever mined coal in any of those states or in Montana either, for that matter.

He may be asked several other questions differing according to the place where he may be seeking work and if miners are scarce he is given a breast of coal with another man *like himself* who has given no better evidence of his fitness. The boss who hires these foreigners does not know if they can dig coal, if they know good roof from bad, if they can timber and handle a safety lamp with judgment, but they are set to work together to practice the risks of mining on themselves, individually and collectively and on the whole force of the mine.

The boss would be very willing to put both those men with competent miners of tested ability and known caution but the qualified miners would not be satisfied. They do not want to teach other men, to do the larger share of the work and get pay only for every other car loaded.

For the union does not permit an uneven division of the output from a working place and so an apprenticeship is out of the question. The incompetent workman might desire to attach himself to a capable instructor. He does not feel safe without a tutor when learning a dangerous trade and he is perhaps confident that he is purchasing his experience dearly but there is no recourse, except to seek some other form of employment. The union will permit no apprenticeship and the capable man wants a veteran miner for a "body."

Perhaps some day we shall have a "minimum wage" and then the miner will not care how small a tonnage he loads and consequently he will be indifferent to the inexperience of the man who works with him. Then, perhaps, there will be more safety for the "greenie" and less risk for the veteran, for there will be no one trying to master mining by mishap and misadventure.

*State mine inspector, Helena, Mont.

The Sociology of Coal Mining

By "Professor of Mining Engineering"

The progress of the coal-mining industry during the nineteenth century was characterized by an enormous increase in the production of coal, and while in 1800 the United States was little known as a source of coal, by 1900 all other nations were passed in point of production and a place had been acquired so far in advance of England and the other coal-producing countries that it is safe to predict that the United States will never again take second rank. In the physical equipment of mines the development has likewise been striking.

While the increase in production and the improvement in equipment will undoubtedly continue, the story of the coal industry at the beginning of the twentieth century is being written in another key, that will undoubtedly mean fewer accidents and greatly improved conditions for those carrying on the work while underground, and for their comfort outside of the mines. This new phase of mining may be technically called the "sociology of mining," or perhaps better the "humanity of mining," and the most striking development of the industry in the next few decades bids fair to be along these lines.

A recent English writer upon the United States says: "The eagerness with which all heads of model establishments would disavow to me any thought of being humane was affecting in its naïveté. It was as though they would blush at being caught in any act of humanity like school boys caught praying. Still to my mind the white purity of their desire to get financial results would often be blurred by the dark stain of a humane motive."

It is seldom that European critics attribute to Americans modesty, or in any way minimize the desire to get the almighty dollar, but it is very evident, even to our English friends, that the American business world is rapidly waking to a realization of the fact that employees have a social side which it pays to keep in touch with, if the hum of industry is to have a musical sound instead of being a constant discord.

Not many years ago the owner, superintendent, foreman and miner were all of one nationality; they lived as neighbors; attended the same church and had common social interests. Now, in many cases the owner is an intangible company or corporation with headquarters in some far removed city. The superintendent and foreman are frequently of a different race, often speak a different language, and have a different religion and very different ideas and ideals from the foreign-speaking miners, who now compose so large a part of the men at the face.

The crying problem, therefore, in the mining industry at present is not improved machinery, but improved men, and this is not meant in any sense as a criticism of the foreign workmen who have come to us from the agricultural countries with no knowledge of mining and who do not even know the English language. The problem before the employer is, therefore, the development of a new race of miners, men who must be schooled not only in the elements of mining, but must also be taught the English language and the ideals and practice of American citizenship. The people who have come to us from Southeastern Europe are splendid types of physical manhood, but they have not that inborn knowledge of mining that was part of the equipment of the old-time English, Welsh, German and American miners.

Numerous forces are already at work to better existing conditions and many of them have to do with the training of the mind rather than the hand in order that the latter may be more skillful. Some of those forces are mining institutes, mining schools, first-aid training and first-aid contests, wash houses, swimming pools, etc., and the building of good mining towns instead of patches. All of these forces are intended to develop not only efficient miners but to inculcate that individual responsibility without which mining can never be made a less dangerous calling.

Coal-mining institutes and the accompanying mining schools have developed wonderfully in a short space of time. Thrice within the past year have 1500 or more men set about the banquet board at the annual meeting of an institute, or first-aid field day. Such banquets and field contests where thousands of men mingle, from the president and general manager to the miner at the face, must have an effect in developing a feeling of greater respect, man to man, and of developing individual responsibility, besides making each one about the mine feel that he is in a peculiar sense his brother's keeper.

Economy in Mine Management

By W. Va. Engineer

The question of what is the difference between true and false economy is one which confronts every mine manager. Is it the putting off of necessary improvements and repairs until the existence of better market conditions, and does it lie in merely considering such when their necessity has become obviously apparent? In my opinion, economical management is that which shows a maximum profit on output, consistent with a minimum factor of property depreciation, *at the end of the year*. In other words, show a fair amount of profit and keep the mine and equipment in first-class condition.

The mine manager whose slogan is "get coal out cheaply and put off repairs as long as possible" may show an enormous profit for several months, but he is a more costly man to owners than one who allows a needless amount of "gingerbread" to eat up all the profits. It must be said for the latter brand that, in nine cases out of ten, he at least leaves the property in such a condition that a practical successor can show good profits, while in the case of the former, no man, regardless of how efficient he may be, is able to obtain results.

Some may question why I specify that economy should be shown *at the end of the year*. Managers, as a rule, endeavor to show a minimum expense account on days that the mine is producing no coal, or during periods when the market is in no condition to absorb the output. This is the direct cause of many sadly needed repairs and improvements being neglected until some more opportune time. As a consequence, what might have been done today for $10 may tomorrow cost $20, and in a few more days have advanced almost beyond belief.

I recall an instance where one of the main haulageways in an important bituminous mine had a small fall one morning, which would have necessitated the removal of about five cars of slate and the placing of three sets of timbers. There were no railroad cars for loading that morning, so the manager sent out the order "cut everybody off," expecting to clean up the fall the next day, and thus place the cost on the day that would produce coal, and in this way make a better showing in the main office. But on the following day there were no cars,

so the order again went out, and it was the same on the third and fourth days. The result was that on the fifth day, when a force of men started to clean up the fall, it had increased to 30 cars of slate and required 16 sets of timbers, besides tying up the haulage for one and one-half days. What would have been true economy in this case is so obvious as to require no comment.

The larger anthracite companies have solved the problem by keeping a regular force of repairmen on duty, and they thus save needless future expense. Why should not smaller concerns do likewise?

Outside improvements are neglected for the same reason. What might have been done for $100 during the months of June or July is put off until the severe weather of February and March, when the cost must necessarily be higher.

We are introducing new mining methods, and in my opinion, we should introduce new methods in economy. Let us regard the year as a unit. I am sure that the report to the directors at the end of the year will look more attractive with an item dated July for $100, than the same item dated February for $200. Think it over. It is worth consideration.

Coaling Ships Without Breakage

Special Correspondence

The coal is lowered into bunkers or into the hold of a vessel by a retarder which being suspended from a crane can be raised or lowered at will. The retarder is fed by a chute or spout which delivers the coal to a variable point in the conveyor. Thus is combined continuous delivery and regulated discharge, the retarder being caused to run at an even speed by an automatic brake of the centrifugal type.

Considering the great care taken to prevent breakage of coal in the various stages of handling at the colliery, it is a matter for surprise that similar precautions are not more in evidence at the ports of shipment. When we consider the variation in the widths and depths of vessels, the rise and fall of the tide, the necessity of distributing the coal over the hold, and the quantity to be transferred in a limited time, it is admitted that the problem of conveying coal from a railroad car at the river or dock side to the bottom of a ship's hold, presents considerable difficulty.

When Not Working Does Not Obstruct Vessels

In loading coal into vessels, moreover, any machinery used must admit of being housed or stowed back within the line of the quay when not in use, so as not to interfere with the masts or bridges of the vessel when the latter is maneuvered in the dock. By use of the Handcock anti-breakage appliance, it is claimed that the above mentioned conditions are fully complied with, while all the difficulties are overcome.

The appliance is well beyond the experimental stage, having been in successful operation for several years on the Blyth docks of the North Eastern Railway Co., of England. From the accompanying diagrams it will be seen that the appliance consists of a vertical tube of rectangular section, suspended from a crane so as to reach to any required depth in the ship's hold.

On three sides it is inclosed while a fourth is fitted with a series of telescopic doors, the top one of which is attached to the telescopic chute or spout by a simple automatic coupling. The height of the anti-breakage appliance can be adjusted independently of the chute, that portion of the vertical tube below the spout being always closed by the telescopic doors, while that above is open to allow the coal to enter the retarder.

Speed of Retarder Regulated by Automatic Brake

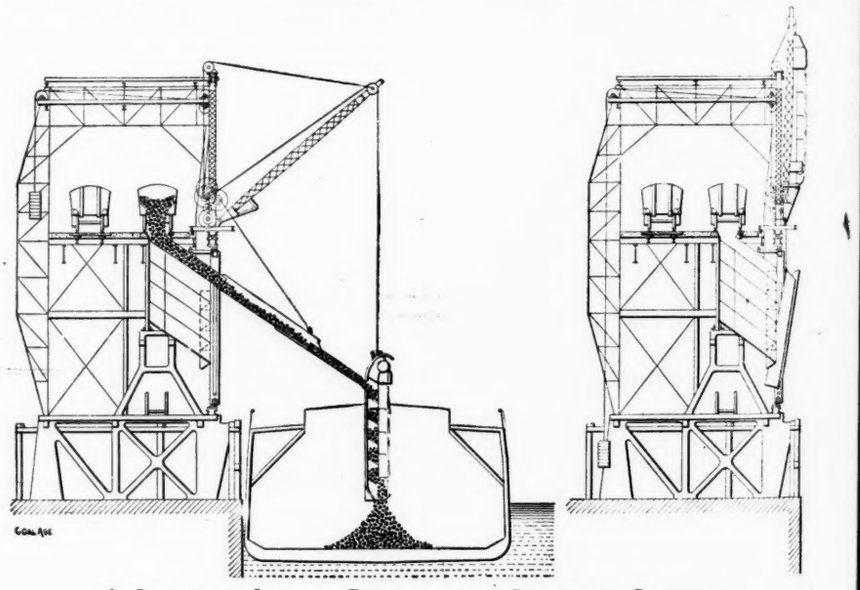
Steel-plate trays, pivoted to endless chains, receive the coal and lower it gently but rapidly to the bottom of the apparatus, where it is deposited with a minimum breakage on the heap of coal which is forming in the hold. The trays are actuated by the weight of the coal itself and the speed is regulated by means of an automatic brake of the centrifugal type.

The capacity of the anti-breaker is quite equal to that of the chute, 800 tons per hour having been loaded through one appliance. Of course the coal can be unloaded at the wharf level into hoppers below its surface. It can then be raised by a conveyor and discharged into the chute or spout, of which mention has been made, the final discharge into the hold of the vessel being regulated by the anti-breaker device.

The long pivoted arm of the chute, together with the anti-breaker, provide a degree of flexibility for all requirements resulting from the varied depth of the vessel and the rise and fall of the tides. The whole of the machinery is erected on the structure and is designed to travel along a pair of rails, so that the anti-breaker and chute may be brought to either hold of the vessel to be laden.

The coal can also be trimmed along the hold by the same means, while for trimming across the hold the chute is provided with traversing motion. By the use of two plants of this description, which can be readily adjusted to two holds of one vessel simultaneously, it is stated that 1200 tons of coal can be loaded per hour, thus effecting a great saving of time for both vessels and rolling stock, as compared with the usual methods of loading.

Probably in many cases this appliance would also obviate the loss of a tide. The anti-breaker can, in most instances, be adapted to existing docks, and can be erected without interruption to the shipment of coal. The makers of this appliance are Messrs. F. Turnbull & Co., of Heaton, Newcastle-on-Tyne.



A System of Loading Boats with a Retarding Conveyor

Hoisting by Electricity in Mines

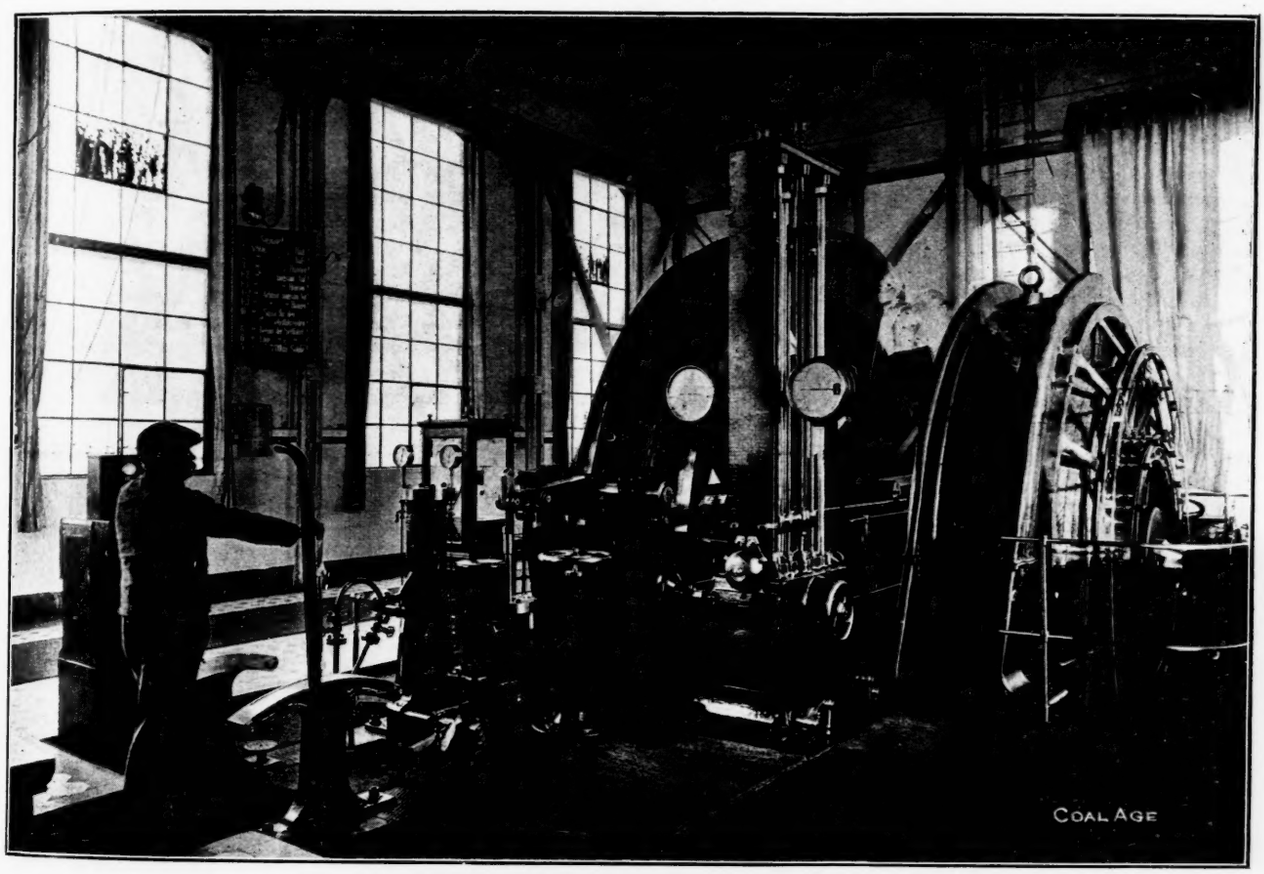
Berlin Correspondence

The relation between efficient hoisting machinery and maximum output. Three-phase systems of installation. The use and advantages of Leonard connections. Storage of energy for fluctuations in load by means of flywheels and slip regulation. A recent installation in Germany.

The economical working of a mine depends, in a way, on the means for hoisting material and workmen. Ordinarily, communication systems lie in one level only. In mines, however, operations have to be carried on in accordance with the location of the various beds of coal. The separate seams are usually equipped with a network of tracks, all of which lead from the distant points on each level to the center point, or the main shaft.

The hoisting apparatus of the main shaft passes, therefore, through all the central points of the system, and forms a vertical system of transportation. In fact, it may be called the principal artery of the mine, since it is the connecting link between the communication systems above and below ground. Any interruption or breakdown in this unit of the plant means, therefore, an interruption in the operation of the hoisting work of the mine. Furthermore, on the efficiency of the hoisting machinery depends the output of the mine.

The problem faced by the mining engineer is to cover the greatest possible area with a single shaft, thus avoiding the extra cost involved in constructing another, and to install, in this shaft, a hoisting gear which unites maximum efficiency with high economy and thorough reliability. Endeavors to solve this problem have led to experiments with water turbines, steam turbines and, later, electricity.



HOISTING ROOM OF THE GLÜCKAUF MINING CO., SAARSTEDT, GERMANY

SUITABILITY OF ELECTRICITY TO HOISTING OPERATIONS

In view of the fact that quick starting is a desirable feature in hoisting operations, the electric motor is well adapted to this branch of mining. The heavy masses of the cages must be brought from a state of rest to a speed of about 65 ft. per sec., nearly equal to that of an express train, in, say, 22 sec. During this starting period the output will rise from zero to sometimes 1000 hp.

During the second period of the trip the hoisting is done at a constant speed. This period, likewise, lasts a limited time. For example, if it is desirable to hoist from a depth of 1640 ft. at a speed of 65.6 ft. per sec., 25 seconds will be required for the trip. The power consumption during this time is generally at least half that of the starting period.

During the third, or braking period, the speed of the moving masses should be retarded, so that the state of zero motion will be reached as quickly as possible. The winding motor is doing no work during this breaking process. In fact, the motor may be so constructed that it will absorb the work given out by the brakes and utilize its efficiency.

The last period, known as the "interval," during which the cars are unloaded, is a period of rest for the motor. This also lasts but a few seconds, so that a complete trip, with its four periods, takes place in from 60 to 90 seconds.

EFFECT UPON EFFICIENCY

In order to appreciate the economical importance of the electric hoist, it should be studied in connection with the entire

working organization of the mine. Whenever an electric power plant is available, its efficiency will be appreciably increased by also supplying current for the operation of the winding machinery. Thus, on account of the more favorable utilization of the energy, the generating cost of the electric current for pumping, ventilation, lighting and transportation is materially decreased. This will also apply, though not to the same extent, to mining plants where current is supplied by an outside power station.

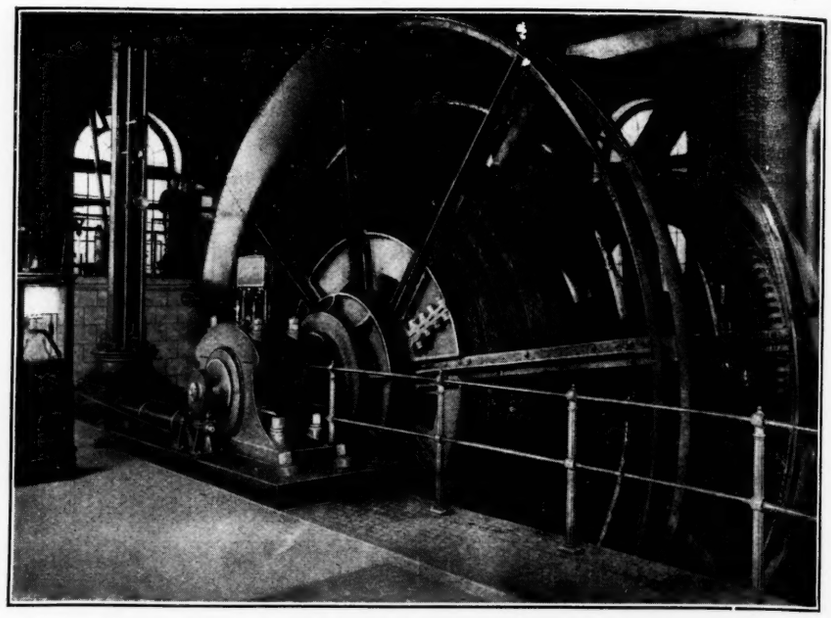
In this case a three-phase system of supply is the one usually adopted. When the hoisting begins at a great depth and is maintained at a low speed, this kind of current may be used directly. In other words, the starting and braking periods must be short in comparison with the actual hoisting period. The motor drive is then constructed on lines similar to those employed in the construction of elevators above ground. The movement of the controlling lever to the right or left causes the winding to take place in one direction or the other, while the amount of the movement determines the speed.

When three-phase current is used directly for driving main-shaft hoists, considerable energy is dissipated in the resistances, due to the fact that, in starting, the current must pass through the regulating apparatus. This is the reason why the direct use of the three-phase current should be limited to shafts of considerable depth, slow winding speed and to places where large generating stations are available.

Systems with Leonard Connections

Another arrangement, known by the name of Leonard connections, has found extensive use and recognition. This system allows a wide and precise control of the hoist, and has an additional advantage, namely, it does not consume any appreciable quantities of electrical energy in resistances. This is accomplished by using the three-phase supply current to operate a motor-generator for generating a direct current. This direct current is then used to drive the hoisting motor. Thus, it is apparent that the regulation of the entire system is a simple problem, and is attained by merely altering the exciting current of the generator, which barely represents 1½ per cent. of the energy of the entire system.

By increasing the intensity of the excitation current, and thereby the dynamo field, the voltage will be raised, causing an increase in the speed of the hoisting motor. A given position of the controller which regulates the intensity of the excitation current corresponds, therefore, to a given hoisting speed. Moreover, since the regulation of a comparatively weak field current can be effected with much finer gradations and more sensitiveness than the regulation of a heavy working current, the desired range can easily be obtained with Leonard connections. Such installations permit of rope speeds of 35 ft. per sec.

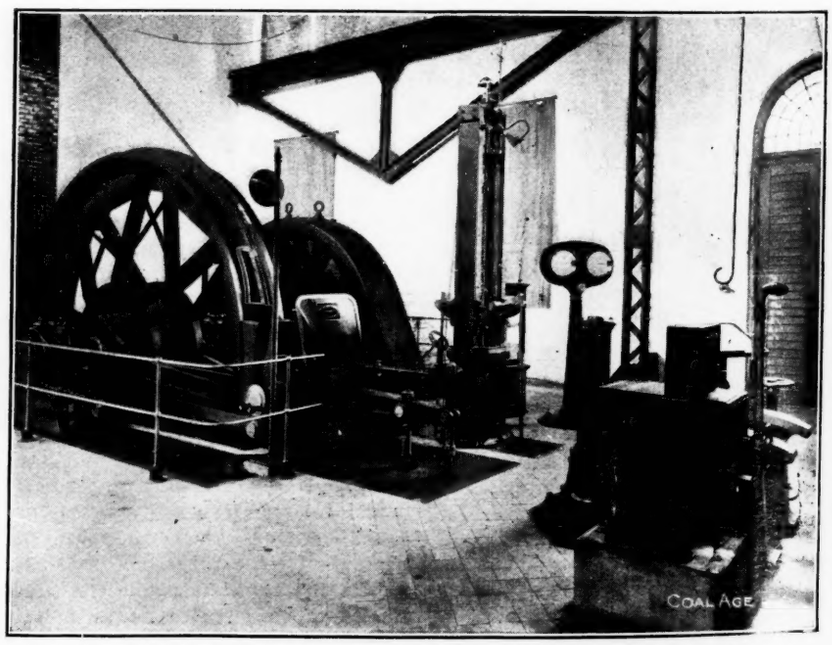


The Hoist of the Poirier Mines, St. Charles

Means of Storing Energy for Use in Fluctuating Loads

Even the Leonard system of control, however, is bound to submit the generating station to variable and intermittent strains. Thus, a certain amount of the central-station energy is dissipated in preventing the varying load from exerting a disturbing effect. The ideal system would be an arrangement in which only an average of the total energy required for a trip would be continuously and uniformly taken from the generating station. The surplus work, thus obtained, could be temporarily and subsequently used in accordance with the amount of energy required for the trip.

The storing of electric energy may suggest to some the storage battery. As a matter of fact, the electric accumulator has been used successfully in electric hoisting plants. It is usually the case, however, that the energy is to be stored for a few seconds only. In examining an ordinary trip, lasting for about one minute, we see the storage of energy would have to take place during about 20 seconds; whereas, energy would be given



Electric Hoist at the Royal Colliery No. 1, Königshütte (Upper Silesia), Germany

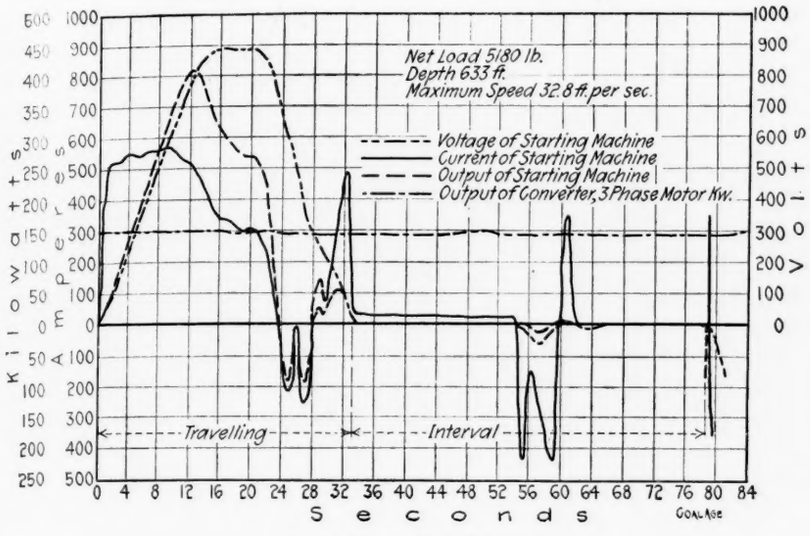


DIAGRAM OF ONE TRIP

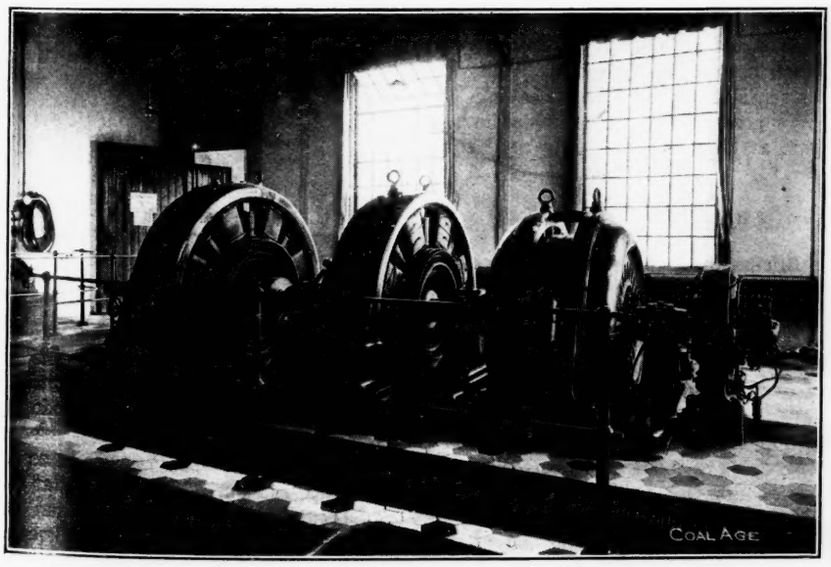
out for 40 seconds. For such short charging and discharging periods, heavy, rapidly rotating masses, such as flywheels, form more advantageous and economical means of storing energy than a battery of accumulators.

Considerations, such as these, have led to the adoption of an arrangement which, in conjunction with the Leonard system, effects a complete equalization of the load on the generating station. A heavy, well balanced flywheel is operated by the converter and stores up its energy during the "intervals," or while under small load. When the heavier load comes on the heavy flywheel comes to the assistance of the converter and gives up its stored energy.

SLIP REGULATION

In order to allow the flywheel to produce this effect a slight speed reduction, called slip, is required for the motor-generator. This is automatically adjusted by a slip regulator, in such a manner that the energy taken from the mains does not exceed an amount corresponding to the average requirements of the plant. If the required energy rises above this, the regulator automatically causes the converter to run slower, thus allowing the flywheel to give up some of its stored energy. On the other hand, if less energy is required the slip automatically accelerates the motion of the flywheel. For this purpose the difference in the energy required by the hoist and the average converter output is utilized.

In a recent hoisting installation at the Gelsenkirchen, Germany, the winding machinery is driven by two 3560-hp. motors. Each unit raises 202 tons of coal per hour from a depth of 1970 ft. The speed attained is 65 ft. per sec., for just a load, and half of that when hoisting the men. It is also possible to drive the drums by one motor, alone, at half the output.



THREE-PHASE, DIRECT-CURRENT CONVERTER WITH BUFFER MACHINE

Examination for Manager of Mine Rescue Stations of Illinois

The position of manager of the mine rescue stations, for the State of Illinois, which recently became vacant by the resignation of Richard Newsam, because of ill health, will be filled by means of an examination to be conducted at Springfield by the state civil service commission, on Oct. 3 and 4, 1912.

This examination will be conducted by a well qualified board of examiners and will include both written and oral work. The oral examination will include a statement of experience in mining. The written work will cover a knowledge of first aid and mine rescue apparatus, general mine operations, including mine maps, ventilation, mine gases, safety lamps and general methods of work, the organization and administration of mine rescue work, and a knowledge of the state laws relating to this work.

This position, which is open to residents of Illinois, has many attractions and the possibilities for doing good are large. The salary is $3000 per year, all necessary traveling expenses being allowed in addition. Applicants must be between the ages of 30 and 60 years. In order to qualify, a candidate must not only be familiar with rescue apparatus and methods, but must have ability as an organizer, for while the actual work of training is mainly in the hands of the men living at each station, the manager must coördinate all the work and must have power to interest both operators and miners in mine rescue and first-aid work.

As a result of the disaster at Cherry, Ill., three years ago, the legislature of the state made provision for the establishment of a mine rescue service that includes three stations and three cars. At each station there is a remodeled Pullman, fitted up for the accommodation of men, with a complete equipment of rescue apparatus.

Each station is in charge of a superintendent and an assistant, and in charge of all of the stations is the manager. General direction of the work is under a commission appointed by the governor of the state, consisting of two miners, two mine operators, one mine inspector, one representative of the department of mining at the University of Illinois, and one representative of the Federal Bureau of Mines.

Illinois is not only the first state to establish such a rescue service, but at present is the only state having a thoroughly organized service of this kind. Up to the present time, about 1500 men have taken rescue and first-aid training in Illinois.

Applicants for the position of manager should write immediately to the state civil service commission, Springfield, Ill.

Water Purification in Power Plants

Special Correspondence

The question of feed water in colliery power plants is a serious one. Naturally, the supply is the last consideration in choosing the location. Consequently impurities of all kinds must be removed in some way, or the life of the boilers and piping will be short. This article tells of a method of removing the dangerous elements in mine water before it is used to generate steam.

The power plant of the coal-mine operator is of vital importance, since the output of the mine is absolutely dependent on its operation. Shutdowns or any curtailment in the necessary power directly affects the output.

The steam boiler is, therefore, the power on which the mine operator is dependent. Hence feeding bad water into the boilers not only causes waste and expense in repairs and cleaning, but also curtails production.

The location of a coal mine is not fixed by the availability of a supply of water for power, but mainly by the location of the coal; every other consideration is secondary. As is often the case, the water question is one of the last things considered, and then only after the boilers have been ruined, or operation seriously handicapped on account of lack of power from the effects of scale and corrosion.

A Difficult Problem

To overcome the waste and expense due to the operation of boilers with water containing impurities which cause scale and corrosion, the mine operator, and nearly all steam boiler operators, have tried many makeshift methods and devices, nearly all of them dependent upon sound mechanical and chemical theory. They fail, however, to perform in the fullest measure what is expected of them, and, at best, are but partially successful. This failure is due to improper application, or to the fact that the efforts are being directed against the effect instead of the cause.

The building of dams, reservoirs, etc., for the storage of water involves an enormous expense, and during periods of protracted dry weather does not always furnish sufficient water. The inevitable result is that during such weather any and every kind of water is fed into the boilers to keep the mine going. This means operating boilers on water totally unfit for boiler use, or the alternative of hauling or pumping water long distances to save the boilers from the evil effects of the always available mine water.

From the mine operator's standpoint, scale is not given serious consideration, as it only means cleaning the boilers periodically or when they cease to supply sufficient steam or require repairs. The fuel waste on account of the scaled heating surfaces of the boiler is of minor importance as coal of inferior quality is used, and even when good coal is taken off the tipple the operator fails to realize that the coal is worth to him the price it would bring if sold.

The coal operator is always interested in the prevention of corrosion due to the acids, etc., usually present in creeks and streams contaminated with mine drainage as well as in the mine drainage itself.

The Action of Sulphuric Acid

Of course, mine waters, creeks, etc., fed with mine drainage, do not furnish desirable feed water, on account of the free sulphuric acid and corrosive sulphates, as well as the scale-forming matter they carry. The principal corroding agent in these supplies is sulphuric acid contained in the sulphates of iron and alumina. They are dissociated by heat, setting the acid free, and precipitating the iron and alumina as sludge or scale.

This sulphuric acid immediately attacks the metal, forming iron sulphate, which decomposes on heating, forming iron hydrate, giving the water the characteristic color of iron rust, and free sulphuric acid. This acid liberated repeats its action upon the metal through an infinite number of destructive cycles.

Since sulphuric acid is non-volatile, the amount in the boiler water is increased by the quantity introduced with the feed. Thus the destruction of the boiler metal is in direct ratio with the concentration which occurs in the boiler. Other corrosive acids and substances are also often present, but are of minor importance as they are not nearly so destructive.

Bad Effects of Poor Feed Water

Briefly, then, the feed water available in coal-mining districts causes waste and expense for the following reasons:

The overheating of plates and tubes.

Corrosion of boilers, pipe lines, heaters, etc., making frequent repairs necessary.

Danger of rupture or explosion, due to weakening of the parts by corrosion or by overheating.

Loss by waste of fuel, due to scale reducing the efficiency of the boiler.

Reduced heating surfaces in water-tube boilers, and decreased water space in all types of boilers.

Necessity for cleaning and repairs.

Priming and foaming.

Loss, due to cost of boiler compounds to prevent scale and corrosion.

Loss, due to the investment in spare boilers to put into commission when it is necessary to take boilers out of service for cleaning or repairs.

Loss of fuel, due to heat lost in cooling a boiler for cleaning or repairs, and required to again bring it into service.

Cost of tube-cleaning machines and repairs to them, as well as labor and power required for operating them.

Loss, due to reduced output on account of boilers out of service for cleaning or repairs.

Scale Troubles

While scale can be fought by periodic cleaning, immediately after each cleaning it begins to form, constantly increasing in amount until the next cleaning. Boiler compounds can be used to offset corrosion, but these are expensive and do not remove the impurities from the water, but rather add to the impurity. Many compounds are, in themselves, corroding agents, and at best are sold at exorbitant prices.

Feed-water heaters are often sold as purifiers, but when used as purifiers, their efficiency as feed-water heaters diminish. Further, the time allowed in the ordinary feed-water heater is not sufficient to complete precipitation, so that, in some classes of water available in the mining regions, a partial precipitation is effected in the heater, the remainder taking place in pipe lines and in the boilers.

The introduction of chemicals into the feed-water heater only adds to the troubles, since reactions are not completed, and unless the reagents used are supplied in great excess, no reactions take place until the water and impurities, as well as the reagents introduced, reach the boiler.

There are many other mechanical and chemical make-shift devices on the market, whose basic theories may be correct enough, but their application to the purification of feed water for boilers does not bring about the desired results.

A Practical Method

There is, however, a perfectly rational and successful method, by means of which a water supply can be so purified that it will neither scale nor corrode the boilers, no matter how long they may be in service. This process is known as the softening and purifying of the water and is accomplished by removing from the water by chemical treatment, sedimentation and filtration, the scale-forming and

corroding substances it contains, before it is fed into heaters and boilers. This method has been in use for years and has been thoroughly tried out, softening and purifying any available water supply, including a large number of mine waters. The reagents used in this process are the cheapest known to chemists and are bought in the open market at prices varying from ¼ to 1¼c. per lb.

Essential Requirements of the Purifier

The apparatus, to give the desired results, must be designed to meet the requirements for bringing about complete chemical reaction in every possible way in order to secure the maximum practical purification with a minimum amount of reagents and attention. These requirements may be summed up as follows:

1. Accurate chemical treatment: the introduction of the proper reagents in the exact quantities required to react with the impurities in the water.

2. Thorough mixture of reagents with the water in order to insure the necessary chemical reactions.

3. Accelerated chemical reaction: This is brought about by thoroughly mixing the sludge of previous softening with the new finely-divided precipitate, and by heating the water, if the nature of the water is such that heat is required to complete the chemical reaction.

4. Complete chemical reaction: which is brought about by perfect mixture of the reagents with the water and by having the apparatus large enough to allow sufficient time for all the reactions to take place. The apparatus must be so designed that every part of it is effective.

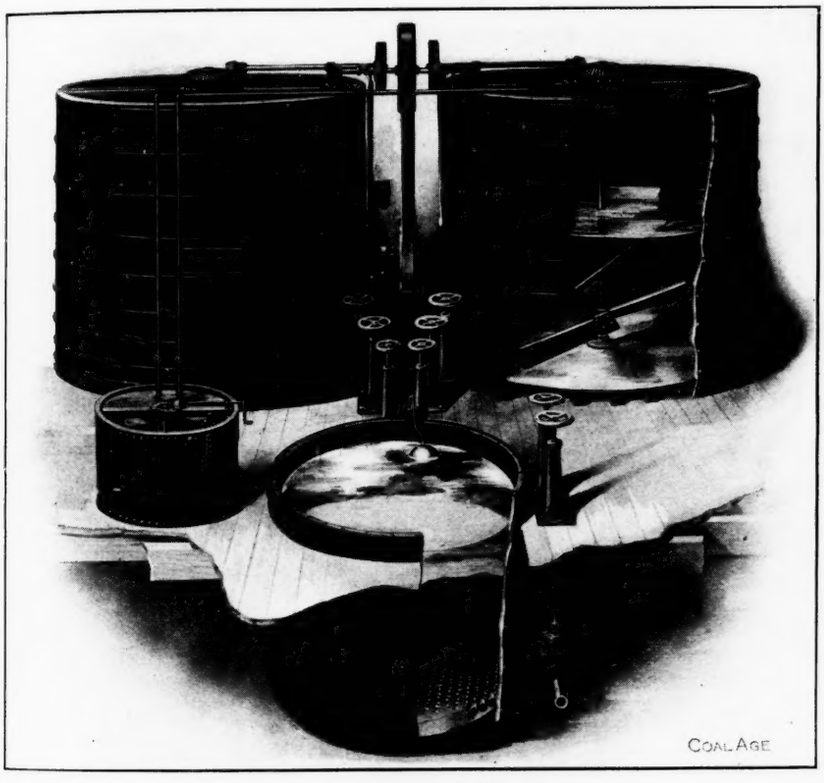
5. Rapid sedimentation: this takes place when the new, finely divided precipitate is weighted by the sludge of previous precipitation, causing it to settle more rapidly and perfectly.

6. Perfect clarification: this is accomplished by allowing time for sedimentation and final clarification by perfect filtration.

A Description of the System

A water-softening and purifying system which meets all the above requirements is described and operated as follows:

The system consists essentially of two treating and settling tanks, equipped with mechanical stirring devices, operated by power, a reagent or chemical mixing tank with mechanical stirring device and steam-jet pump for introducing reagents into treating tanks, and a mechanical gravity filter.



A View of the Tanks

The treating tanks are filled alternately with water. While a tank is filling the reagents are introduced and thoroughly mixed with the water by means of the mechanical stirring devices, consisting of a specially designed power paddle.

The paddle not only mixes the reagents with the water, but at the same time stirs up from the bottom the sludge of preceding purification. This sludge floats in the water, hastens the chemical reaction and causes the new finely divided precipitate to form large woolly flakes, heavy enough to settle quickly as soon as the water stops moving. This paddle stirring device is the simplest and most efficient that can be devised; with reasonable care it will not get out of order, and it does not have to be cleaned to keep it in working condition. Furthermore, it requires very little power.

Taking the Softened Water Out of the Tank

After a tank is filled, the stirring device is stopped, and the water permitted to stand, in order to allow the precipitate to settle to the bottom of the tank. The softened water is taken out of the tank by means of a hinged floating outlet pipe, arranged to rise and fall with the level of the water, so that the water is always drawn from the top. The water at the top carrying the least amount of sludge, passes through the floating outlet pipe to the filter beds; therefore, the filters can be run the longest possible time without being cleaned. The rate of flow to the filters is automatically controlled, so that they are supplied with water as fast as it is drawn from them.

While one tank is being filled, treated and settled, the other is supplying treated water, and by the time it is empty the first tank is ready for use. In this way a constant supply of accurately treated, soft, clear water is always available for immediate use.

Pipe Connections and Valves

Pipe connections for filling the tanks and washing the sludge from the tanks, are placed in the bottom. The washing of the settling tanks needs to be done only about once a week, or when the sludge becomes deep enough to interfere with the stirring. To do this, it is necessary only to open the valves to the sewer and start the stirring device to mix up the sludge, which is soft enough to flow through the pipe into any sewer.

From the above description, it will be apparent that this type of apparatus is one which will give the most accurate treatment with varying water supplies, as well as take care of totally different supplies, as occasion may demand in different seasons of the year.

With this apparatus it is possible to shift from creek water to mine water, and make the treatment that may be necessary by means of the simple color tests employed. No matter what supply is available, a water free from scale-forming and corroding substances can be fed into boilers, thus making it possible to operate the boilers year in and year out with a minimum expense for maintenance and a decided saving in fuel.

It seems rational that a coal-mine operator should equip himself to such an extent as to be able to operate his boilers without unnecessary shutdowns, and not be at the mercy of weather conditions for a water supply.

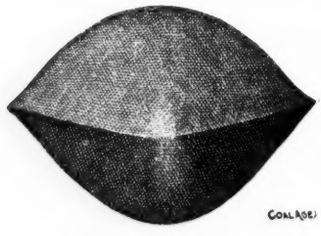
Briquetting Small Coal

Special Correspondence

Some remarks concerning the size and shape of briquettes, and a description of an important plant owned and operated by the Italian Government.

Fashion has prevailed in briquetting as in everything else, and to a very considerable extent the briquettes have been rectangular in form and of fairly large size, probably because large briquettes can be produced more cheaply than small ones. There are, however, objections to the use of large rectangular lumps, one being, of course, the comparative difficulty of handling in stoking, while with the rectangular form there are more or less sharp corners which in the course of transport, loading and unloading are liable to become damaged, leading to the production of a proportion of small chips and broken pieces.

For these reasons "ovoid" briquettes have been devloped of the shape shown in accompanying illustration, and it is the opinion of experts that this type of briquette will ultimately replace the ordinary rectangular one. It is claimed for this type that a harder briquette can be produced with a smaller percentage of pitch and that the amount of steam generated with a given quantity of fuel is greater than with the rectangular, owing to the uniform fire which can be obtained and the ease with which the air can circulate among the briquettes. Moreover, ovoid briquettes, when made from a bituminous or semibituminous coal with a pitch binder, are more suitable for use in open grates and steaming purposes, while when made from anthracite, or a small coal having less than 10 per cent. of volatile constituents, they are an excellent fuel for burning in stoves.



OVOID BRIQUETTE

AN ITALIAN PLANT

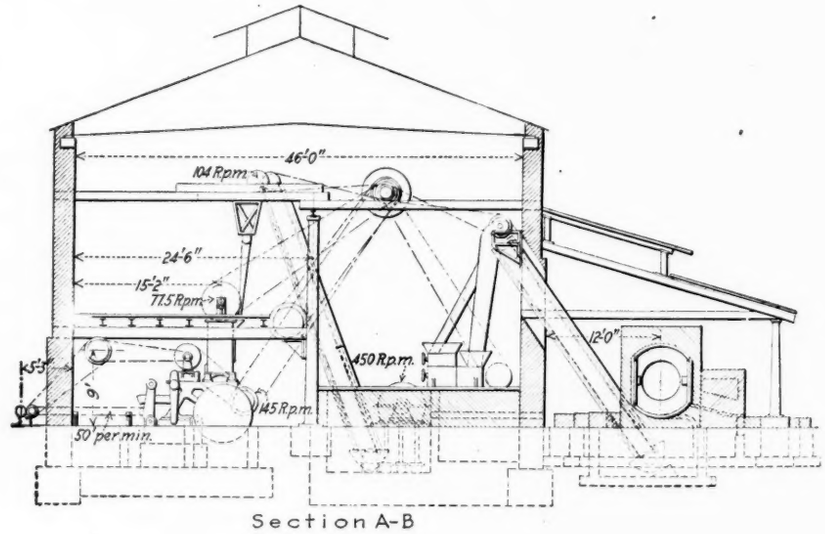
Bearing these points in mind it will be interesting to refer to the firm of Wm. Johnson & Sons, Ltd., of Leeds, England, who have just constructed an important plant for the Italian Government. This will have a minimum production of 15 tons per hour of either ovoid briquettes, weighing 5 oz. each, or of rectangular briquettes measuring 7x4¾x4⅜ in. These briquettes are intended solely for consumption on board warships of the Italian Navy, and this development is, therefore, of considerable interest.

It may be mentioned in passing that this firm received at the St. Louis Exposition a gold medal for their briquetting plant and the United States Government bought the plant in question at the close of the World's Fair in order to carry out some tests in the briquetting of various coals.

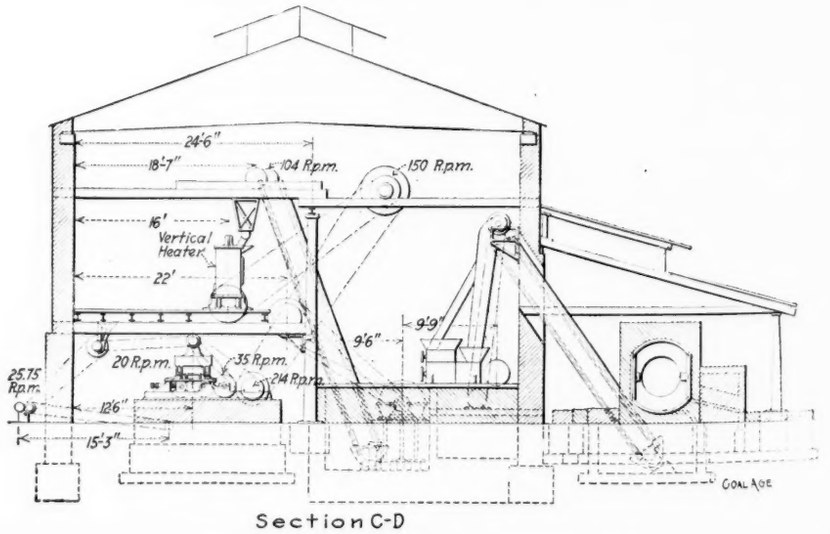
Some brief description of the plant for the Italian Government may be of interest. The coal is fed from wagons into an elevator, from which it is carried into a mixer. The pitch is first broken small and elevated into a measurer, where it is properly proportioned for mixing with the coal.

After thorough intermixing the mass passes forward into a disintegrator where it is reduced to powder. It is then elevated and delivered into a vertical heater where the pitch is melted by the injection of steam at a suitable temperature and the whole brought to a plastic condition. It is then discharged into the ovoid press which is provided with an automatic apparatus for giving regular feed to the mold rollers. As the briquettes issue from the machine they drop on to a belt conveyor which delivers them into railway cars.

It will be seen that the whole process from delivering the raw coal and pitch to their respective hoppers to the de-



Section A-B



Section C-D

SECTIONAL ELEVATIONS OF BRIQUETTING PLANT

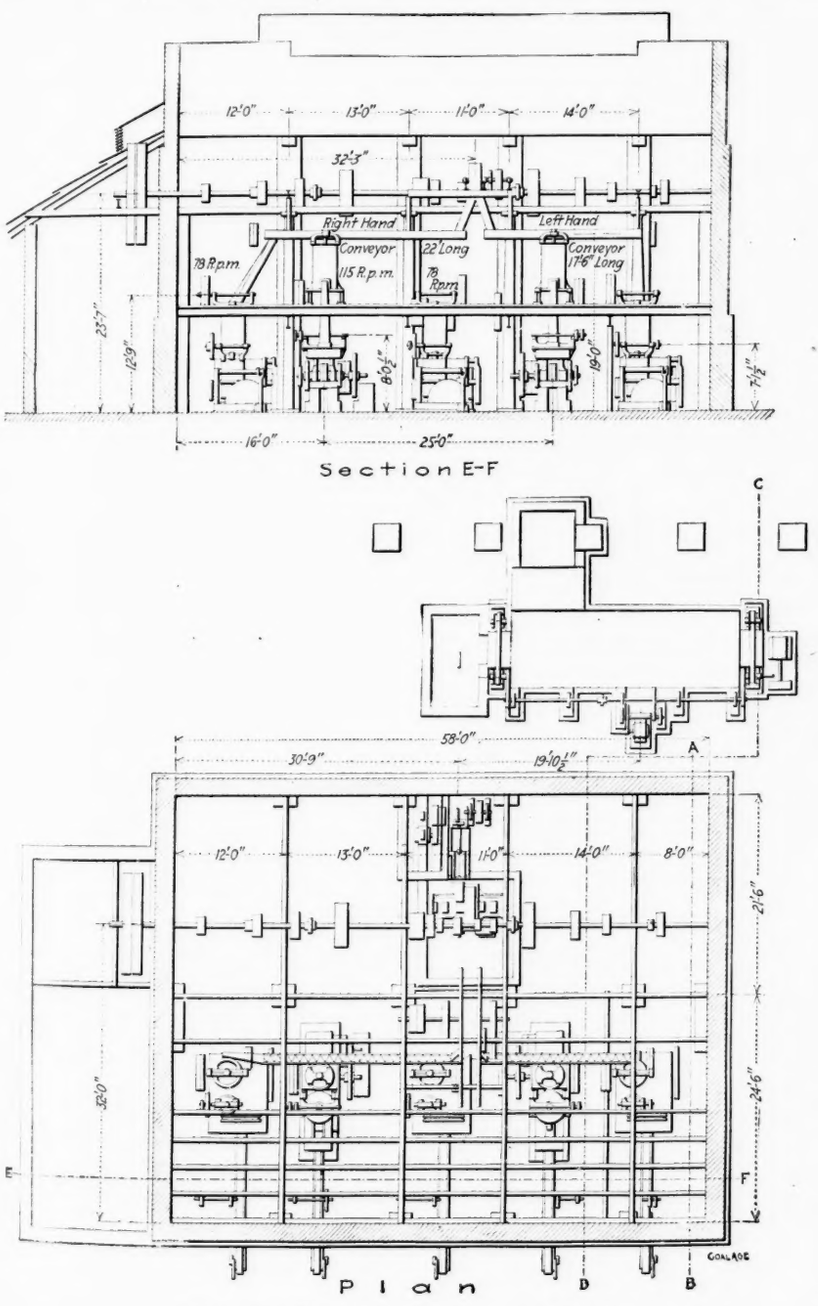
livery of the finished briquettes is entirely automatic. The preparing machinery consists of a disintegrator, elevators, mixer and measurer. It handles 15 tons of either rectangular or ovoid briquettes per hour. The rectangular briquette reduces the quantity of waste material which has to be detached from the ordinary ovoids by means of jigging screens, etc. It is found that this amounts in some instances to 30 per cent. of the total output, and the new shape which is described by the makers as the "eggette" form almost entirely avoids this waste.

Method of Operation

The briquetting press used has a continuous action without a reciprocating motion in any part, this distinguishing it from the toggle or screw presses at present on the market. It is thus able to produce briquettes at a great speed and there is no complicated mechanism. In spite of this it is extremely massive in construction and stands the enormous pressure well.

In order to insure a positive feed an efficient form of automatic feed is provided. The pitch cracker simply consists of a hopper at the bottom of which circular steel grate bars are fitted. Between these steel beater bars revolve, driven by a belt pulley. The mixer and measurer consist of two troughs, one above the other, containing shafts fitted with blades. The top one receives the broken pitch and delivers it at a uniform speed into the lower trough. The coal is delivered directly into the lower trough, and as it is carried at a uniform speed a regular quantity of pitch is mixed with it. The percentage of pitch to be mixed with the coal is varied by means of varying the ratios of the chain wheels driving the blades of the shafts.

The vertical heater or cooker is one of the most important accessories in this briquette, making plant as the character of the finished briquette depends to a large extent upon the efficient working of this apparatus. It consists of a vertical chamber containing revolving blades which mix and stir the material. While this is being done superheated steam is blown among the material, or alternatively a steam jacket is utilized for warming the mass.



Plan and Section of Briquetting Plant

Mine Accidents in the Pittsburgh Coal Seam

By Henry McClusky*

The Federal Bureau of Mines, whose testing station is located at Pittsburgh, Penn., is actively dealing with prevention and rescue work, in its relation to mine explosions; and is still engaged in testing explosives that are designed for use in coal mines. As a result of the work of the Bureau, accidents of this nature have decreased in number, during the last two years, in the mines of this country, showing progress along these lines.

The principal cause of accidents, inside the mines of the Pittsburgh coal seam, is falls of roof, slate and coal. The report of the Department of Mines, 1910, for the bituminous mines of Pennsylvania, shows that 63.22 per cent. of all inside accidents are due to falls; and only 3.1 per cent. due to explosions of gas and dust. The fact is evident, therefore, that the treacherous drawslate, in the Pittsburgh coal seam, is the coal miner's deadly enemy, and demands his closest attention.

Great credit is due the bituminous mine inspectors, who have been making every effort to reduce this class of accidents in the Pittsburgh seam, to a minimum. A while ago they sent a neat plan to every foreman and superintendent, in their respective districts, describing a system of posting the drawslate in rooms and pillar workings, and recommended that it should be adopted and carried out to the letter, in this seam. The decrease in this class of accidents, shown by the Report for 1911 speaks well both for the state mine inspectors and the mine officials.

The mine officials should and have worked in harmony with the inspectors, whose recommendations are generally for

*Gradatim, Penn.

the best and if carried out and enforced will tend not only to decrease the number of accidents, but to reduce the cost of mining and increase the output. The practical mine foreman knows that if the state mine law is observed it is better for all concerned. Safety in and around the mines is and should be the first consideration of all mine officials and employees. Accidents in the mine always mean a loss to the company, as the mine is generally thrown idle for a time, varying from an hour to many days or weeks, to say nothing of doctor bills and law suits. In regard to discipline, there is no place where it is more necessary than in coal mines, because so large a percentage of the mine workers in this country are men from central and southern Europe, who are unfamiliar with the English language. These men need discipline, not for their own protection only, but for the protection of all. Mine officials should have moral courage and see that proper discipline is enforced in all matters pertaining to health and safety. By their working in harmony with the state mine inspectors, accidents from falls of roof will be decreased.

The Spiro Steam Turbine

The recent invention of what is known as the Spiro turbine is destined to become of unusual interest to the mining industry of this country. The construction is extremely simple. It consists of a pair of helical gears, shown in Fig. 2, closely fitted into a double cylinder or case, Fig. 1, covered at the ends by the heads. The latter contain the bearings.

Analysis of Steam Action

Steam is admitted at point *A* of each rotor, in an outward direction. The impact starts the rotors in the direction indicated by the arrows. As each tooth pocket passes the inlet port, this action is repeated.

This is, however, only the first function of the steam. A second and more important action takes place the moment each tooth pocket has passed the port. After it is shut off from further supply, the steam, or compressed air, is confined in the V-shaped groove with the closely fitting cylinder forming the fourth side of the enclosure. Each tooth space now becomes an individual cylinder and expansion takes place very much like in a steam engine. Instead of pushing against a piston, however, the fluid under pressure pushes against the opposite rotor along the line where the gears intermesh.

When the groove passes the line of contact between the two rotors the limit of expansion has been reached and the exhaust takes place.

The impact and expansion takes place at a high velocity. It will be seen that with 2000 r.p.m. and 20 teeth in each of the two rotors, there are 80,000 successive impacts and expansions per minute. It is almost impossible to realize the rapidity of this steam action, but this fact makes it all the more obvious that a tremendous power can be developed in an extremely restricted space.

The Operating Speed

The operating speed of this turbine ranges from 1200 up to 5000 r.p.m. By means of reducing gears, a speed as low as 400 r.p.m. is easily obtained. This makes the Spiro adapted for direct connection to a great variety of machines and appliances in the coal mines, such as running the car elevators, shakers, conveyors, ventilating fans, coal cutters, generators, pulverizers, etc.

A Few Features in the Construction

The absence of any valves, blades, and other parts requiring adjustment and renewal simplifies the operation very much. The bearings are so constructed as to preclude the possibility of trouble. The nickel steel shaft runs in a bronze bushing. At one end is an oil-ring, carrying oil from the reservoir up to the shaft; from this point inwards is a spiral groove, which forces the oil inwards over the entire bearing surface. At the inner end, there is a return passage down to the reservoir. Oil is thus kept circulating continuously, and distributed over the bearings by positive force, the spiral oil groove constituting virtually what is known as an Archimedes' pump, one of the oldest of mechanical devices.

A very close speed regulation is obtained by a lately developed patented governor, which has been in use on several outfits already in operation in various parts of the country.

When run on compressed air, this turbine finds application within the mine where steam cannot be used. Among the many interesting outfits developed by the manufacturers is a turbine-driven exhaust fan, for disposal of coal dust from the pulverizers. It sucks up the fine dust which is so harmful and annoying to the laborers, and discharges it at a more distant point where its presence is not objectionable.

In order that a mine explosion can occur, combustible material must be present as well as a sufficient amount of air or free oxygen to support the combustion. The carbon and the volatile matter or hydrocarbons of the coal furnish the principal part of the food or combustible material that is necessary to every explosion. The richer the coal in hydrocarbons and the drier and finer the dust, the more dangerous its accumulation becomes. The strength or force of an explosion depends on the proportion of gas in the air, together with the amount of dust held in suspension and the character of the flame that causes the ignition. The degree of inflammability and fineness of the dust determine largely the rapidity of the combustion and consequently the force of the explosion.

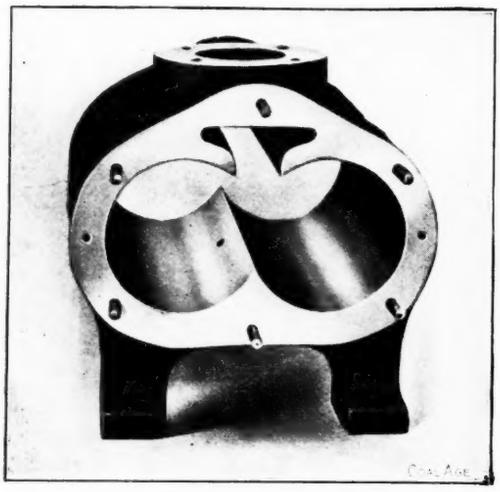


Fig. 1. The Spiro interest. ... ed in passing that

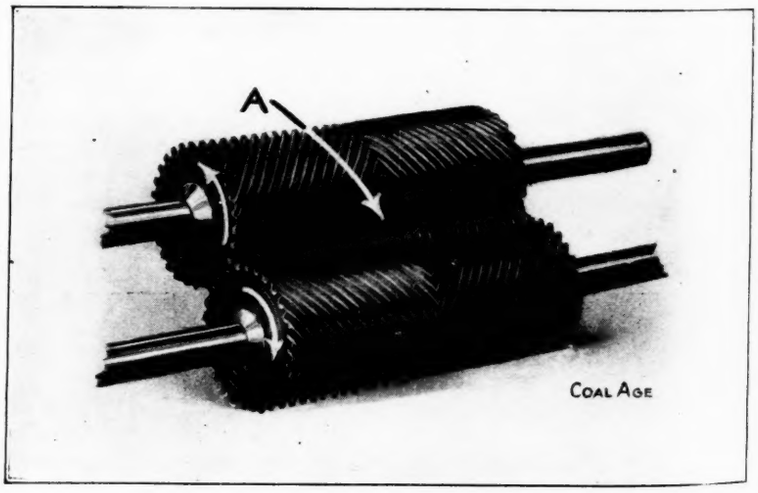


Fig. 2. The Herringbone Gears

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Alaska Coal Land Problems

Speaking at the San Francisco meeting of the American Institute of Mining Engineers, October, 1911, R. W. Raymond said:

According to Alfred H. Brooks' very low figures for Bering Coal (based on a product of 1,000,000 tons per annum, railroad freight of only $0.66, ocean freight of $0.85, unloading charges of $0.15, and profit to the mine operator of $0.15 per ton), Mr. Brooks says that Bering bituminous coal should be delivered at the wharf in Seattle at $3.91 to $4.10, and Bering anthracite at $5 per ton.

[1]Present Indications in the California Oil Fields, Bulletin No. 64, p. 377, April, 1912.

Oil Has Pushed Coal Out of the Market

Now the paper presented at the San Francisco meeting, October, 1911, by Mark L. Requa[1], declares that "comparing California oil with Alaska coal, it is apparent that oil has complete control of the field." Mr. Requa deems it "safe to say that California oil will dominate the fuel market on the Pacific coast during the present century, and probably far into the next century."

He shows by detailed figures that coal must sell at $3.50 per ton at Douglas Island, Alaska, in order to compete with oil at 60c. per bbl. (the present price being only 30c.) at the well. Mr. Bain himself admits that "the railroad and the leading coast industries have now been converted to burn oil imported from California."

A Coal Mine in Alaska Would Not Pay

In other words, a large coal mine opened at the present time in Alaska, by the government or anybody else, could not be made to pay, unless it were supported by government contracts, appropriations, or privileges—in which case, it would simply be an arbitrary and artificial interference with an established industry of California.

From the standpoint of "conservation," the case is still stronger. The superabundant oil supply of California is irreparably running to waste. Why should this treasure be sacrificed for the sake of the premature development of a competitive industry?

The Weathering of Coal

By Horace C. Porter*

The weathering of coal reduces its calorific power less than one per cent. a year and sub-bituminous coals lose only about two percent. per annum. Its action has been much exaggerated and the storage of coal under water involves an expenditure of money which the weathering action alone does not warrant.

*Bureau of Mines.

Note—Part of a paper presented to the Pittsburgh Section, American Chemical Society, under title "Storage of Coal and Spontaneous Combustion."

In 1910 the United States produced and consumed about 5¼ tons of coal per individual, and the total fuel costs of the country, for manufactures, transportation, heat and light, etc., averaged nearly $20 per year for each individual, or $100 for each family.

The railways of the United States used in their locomotives in 1906, 90,000,000 tons of coal, or one-fifth of the country's entire coal production; in other words, each family paid $20 a year to keep the railroads alone supplied with coal.

Need For Storage

Methods of handling and of stocking a raw material so nearly universally indispensable as is fuel, assume importance when the consumption at any one point is large and when conditions demand a large surplus stock. The producer of coal is often required to ship his product long distances by land or by water, and to store large quantities at a distributing point.

The possibility of strikes at the mines or on the railroads, of car shortages, and of delays due to weather conditions, frequently make it advisable, and in fact, a common practice, to store as much as 500,000 tons of coal at one point for a period of three months to a year or longer.

At Montreal and vicinity and in Nova Scotia 250,000 to 500,000 tons in one pile are sometimes kept in storage, owing to the difficulties of transportation in the winter season. At Duluth and Superior and other distributing points on the Great Lakes one-half million tons is a common amount in stock at one point. Byproduct-coke and gas companies in the Chicago district have on hand open-air coal piles of 300,000 to 500,000 tons each during the fall and winter season.

The Use of Submergence Tanks for Storage

The Western Electric Company, at Hawthorne, Ill., near Chicago, in an effort to improve their coal storage equipment installed in 1907 a submergence storage plant for 10,000 tons. On the Isthmus of Panama, the Panama Railroad Company maintains a large open-air stock pile as a safeguard against delays in delivery of cargoes from the United States.

Many of the navy yards and naval coaling stations remote from sources of supply, as at Key West, Fla., Southern California points, Hawaii, Samoa and the Philippines, may keep as much as 50,000 tons in stock for protracted periods.

There will, probably, be coaling stations on the Isthmus of Panama after the completion of the canal, which will need to be of large capacity on account of the large demand and the distance from the source of supply.

Does Submergence Pay?

If it is true that coal stored in such quantities for long periods deteriorates in quality, it is important to determine whether the percentage loss of value is great enough to make the aggregate loss in a large stock a serious matter. Does the loss in heat units, in say, 10,000 tons, during one year's exposure, mean a money loss sufficient to justify the cost of under-water storage or other protective equipment?

The Western Electric Company, at Chicago, from preliminary experiments, concluded that such cost was justified in case of Illinois coal, and in 1907 installed, as here mentioned, a 10,000-ton under-water storage plant of concrete construction. After two years' storage they found that their submerged coal had a heating value about 2 per cent. greater than that of a similar coal which had weathered two years.

This small difference hardly justifies the cost (about $70,000 for construction and 7 cents per ton for handling), but the avoidance of all risk of spontaneous fires in the stock may be considered to have been in itself sufficient justification.

the best and if carried out and enforced will tend not only to decrease the number of accidents, but to reduce the cost of mining and increase the output. The practical mine foreman knows that if the state mine law is observed it is better for all concerned. Safety in and around the mines is and should be the first consideration of all mine officials and employees. Accidents in the mine always mean a loss to the company, as the mine is generally thrown idle for a time, varying from an hour to many days or weeks, to say nothing of doctor bills and law suits. In regard to discipline, there is no place where it is more necessary than in coal mines, because so large a percentage of the mine workers in this country are men from central and southern Europe, who are unfamiliar with the English language. These men need discipline, not for their own protection only, but for the protection of all. Mine officials should have moral courage and see that proper discipline is enforced in all matters pertaining to health and safety. By their working in harmony with the state mine inspectors, accidents from falls of roof will be decreased.

The Spiro Steam Turbine

The recent invention of what is known as the Spiro turbine is destined to become of unusual interest to the mining industry of this country. The construction is extremely simple. It consists of a pair of helical gears, shown in Fig. 2, closely fitted into a double cylinder or case, Fig. 1, covered at the ends by the heads. The latter contain the bearings.

Analysis of Steam Action

Steam is admitted at point *A* of each rotor, in an outward direction. The impact starts the rotors in the direction indicated by the arrows. As each tooth pocket passes the inlet port, this action is repeated.

This is, however, only the first function of the steam. A second and more important action takes place the moment each tooth pocket has passed the port. After it is shut off from further supply, the steam, or compressed air, is confined in the V-shaped groove with the closely fitting cylinder forming the fourth side of the enclosure. Each tooth space now becomes an individual cylinder and expansion takes place very much like in a steam engine. Instead of pushing against a piston, however, the fluid under pressure pushes against the opposite rotor along the line where the gears intermesh.

When the groove passes the line of contact between the two rotors the limit of expansion has been reached and the exhaust takes place.

The impact and expansion takes place at a high velocity. It will be seen that with 2000 r.p.m. and 20 teeth in each of the two rotors, there are 80,000 successive impacts and expansions per minute. It is almost impossible to realize the rapidity of this steam action, but this fact makes it all the more obvious that a tremendous power can be developed in an extremely restricted space.

The Operating Speed

The operating speed of this turbine ranges from 1200 up to 5000 r.p.m. By means of reducing gears, a speed as low as 400 r.p.m. is easily obtained. This makes the Spiro adapted for direct connection to a great variety of machines and appliances in the coal mines, such as running the car elevators, shakers, conveyors, ventilating fans, coal cutters, generators, pulverizers, etc.

A Few Features in the Construction

The absence of any valves, blades, and other parts requiring adjustment and renewal simplifies the operation very much. The bearings are so constructed as to preclude the possibility of trouble. The nickel steel shaft runs in a bronze bushing. At one end is an oil-ring, carrying oil from the reservoir up to the shaft; from this point inwards is a spiral groove, which forces the oil inwards over the entire bearing surface. At the inner end, there is a return passage down to the reservoir. Oil is thus kept circulating continuously, and distributed over the bearings by positive force, the spiral oil groove constituting virtually what is known as an Archimedes' pump, one of the oldest of mechanical devices.

A very close speed regulation is obtained by a lately developed patented governor, which has been in use on several outfits already in operation in various parts of the country.

When run on compressed air, this turbine finds application within the mine where steam cannot be used. Among the many interesting outfits developed by the manufacturers is a turbine-driven exhaust fan, for disposal of coal dust from the pulverizers. It sucks up the fine dust which is so harmful and annoying to the laborers, and discharges it at a more distant point where its presence is not objectionable.

In order that a mine explosion can occur, combustible material must be present as well as a sufficient amount of air or free oxygen to support the combustion. The carbon and the volatile matter or hydrocarbons of the coal furnish the principal part of the food or combustible material that is necessary to every explosion. The richer the coal in hydrocarbons and the drier and finer the dust, the more dangerous its accumulation becomes. The strength or force of an explosion depends on the proportion of gas in the air, together with the amount of dust held in suspension and the character of the flame that causes the ignition. The degree of inflammability and fineness of the dust determine largely the rapidity of the combustion and consequently the force of the explosion.

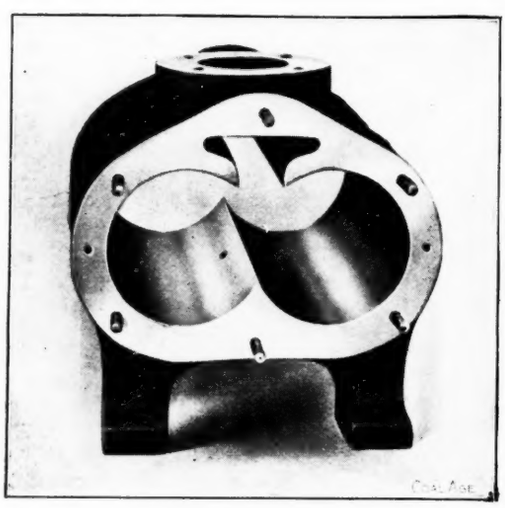


FIG. 1. THE SPIRO CYLINDER

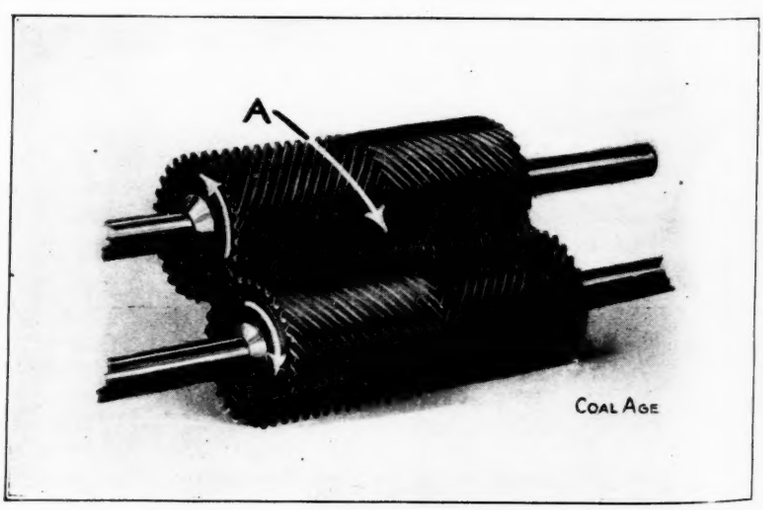


FIG. 2. THE HERRINGBONE GEARS

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Alaska Coal Land Problems

Speaking at the San Francisco meeting of the American Institute of Mining Engineers, October, 1911, R. W. Raymond said:

According to Alfred H. Brooks' very low figures for Bering Coal (based on a product of 1,000,000 tons per annum, railroad freight of only $0.66, ocean freight of $0.85, unloading charges of $0.15, and profit to the mine operator of $0.15 per ton), Mr. Brooks says that Bering bituminous coal should be delivered at the wharf in Seattle at $3.91 to $4.10, and Bering anthracite at $5 per ton.

[1]Present Indications in the California Oil Fields, Bulletin No. 64, p. 377, April, 1912.

Oil Has Pushed Coal Out of the Market

Now the paper presented at the San Francisco meeting, October, 1911, by Mark L. Requa[1], declares that "comparing California oil with Alaska coal, it is apparent that oil has complete control of the field." Mr. Requa deems it "safe to say that California oil will dominate the fuel market on the Pacific coast during the present century, and probably far into the next century."

He shows by detailed figures that coal must sell at $3.50 per ton at Douglas Island, Alaska, in order to compete with oil at 60c. per bbl. (the present price being only 30c.) at the well. Mr. Bain himself admits that "the railroad and the leading coast industries have now been converted to burn oil imported from California."

A Coal Mine in Alaska Would Not Pay

In other words, a large coal mine opened at the present time in Alaska, by the government or anybody else, could not be made to pay, unless it were supported by government contracts, appropriations, or privileges—in which case, it would simply be an arbitrary and artificial interference with an established industry of California.

From the standpoint of "conservation," the case is still stronger. The superabundant oil supply of California is irreparably running to waste. Why should this treasure be sacrificed for the sake of the premature development of a competitive industry?

The Weathering of Coal

By Horace C. Porter*

The weathering of coal reduces its calorific power less than one per cent. a year and sub-bituminous coals lose only about two percent. per annum. Its action has been much exaggerated and the storage of coal under water involves an expenditure of money which the weathering action alone does not warrant.

*Bureau of Mines.

Note—Part of a paper presented to the Pittsburgh Section, American Chemical Society, under title "Storage of Coal and Spontaneous Combustion."

In 1910 the United States produced and consumed about 5¼ tons of coal per individual, and the total fuel costs of the country, for manufactures, transportation, heat and light, etc., averaged nearly $20 per year for each individual, or $100 for each family.

The railways of the United States used in their locomotives in 1906, 90,000,000 tons of coal, or one-fifth of the country's entire coal production; in other words, each family paid $20 a year to keep the railroads alone supplied with coal.

Need For Storage

Methods of handling and of stocking a raw material so nearly universally indispensable as is fuel, assume importance when the consumption at any one point is large and when conditions demand a large surplus stock. The producer of coal is often required to ship his product long distances by land or by water, and to store large quantities at a distributing point.

The possibility of strikes at the mines or on the railroads, of car shortages, and of delays due to weather conditions, frequently make it advisable, and in fact, a common practice, to store as much as 500,000 tons of coal at one point for a period of three months to a year or longer.

At Montreal and vicinity and in Nova Scotia 250,000 to 500,000 tons in one pile are sometimes kept in storage, owing to the difficulties of transportation in the winter season. At Duluth and Superior and other distributing points on the Great Lakes one-half million tons is a common amount in stock at one point. Byproduct-coke and gas companies in the Chicago district have on hand open-air coal piles of 300,000 to 500,000 tons each during the fall and winter season.

The Use of Submergence Tanks for Storage

The Western Electric Company, at Hawthorne, Ill., near Chicago, in an effort to improve their coal storage equipment installed in 1907 a submergence storage plant for 10,000 tons. On the Isthmus of Panama, the Panama Railroad Company maintains a large open-air stock pile as a safeguard against delays in delivery of cargoes from the United States.

Many of the navy yards and naval coaling stations remote from sources of supply, as at Key West, Fla., Southern California points, Hawaii, Samoa and the Philippines, may keep as much as 50,000 tons in stock for protracted periods.

There will, probably, be coaling stations on the Isthmus of Panama after the completion of the canal, which will need to be of large capacity on account of the large demand and the distance from the source of supply.

Does Submergence Pay?

If it is true that coal stored in such quantities for long periods deteriorates in quality, it is important to determine whether the percentage loss of value is great enough to make the aggregate loss in a large stock a serious matter. Does the loss in heat units, in say, 10,000 tons, during one year's exposure, mean a money loss sufficient to justify the cost of under-water storage or other protective equipment?

The Western Electric Company, at Chicago, from preliminary experiments, concluded that such cost was justified in case of Illinois coal, and in 1907 installed, as here mentioned, a 10,000-ton under-water storage plant of concrete construction. After two years' storage they found that their submerged coal had a heating value about 2 per cent. greater than that of a similar coal which had weathered two years.

This small difference hardly justifies the cost (about $70,000 for construction and 7 cents per ton for handling), but the avoidance of all risk of spontaneous fires in the stock may be considered to have been in itself sufficient justification.

A few other instances are known of commercial tests of submerged storage in the United States, for example, one of 12,000 tons at Minneapolis, Minn.; but the practice has not become by any means general.

Weathering in Itself Lowers Calorific Power But Little

The Bureau of Mines, largely at the instance of the Navy Department, took up the storage problem in the summer of 1909. Experiments were begun, to determine the loss of heating value undergone during storage by the actual coal substance independently of moisture changes and of inequalities in ash, which, of course, in themselves affect the heating value.

The losses suffered by coal in storage may be due to two causes: (1) weathering at ordinary temperatures, and (2) spontaneous heating, with consequent burning of the coal and distillation of gases. The former has been held by many authorities to be a serious factor, losses of 10 to 50 per cent., due to weathering alone, having been claimed in various reports of experiences.

There is little doubt now, however, that this first factor is a minor one as compared to the serious danger from the second cause, namely, spontaneous heating. A study of both factors has been undertaken by the bureau with a view to determining the extent of the loss and contributing to an explanation of the nature of the phenomena.

Actual Determinations

First, for ascertaining the amount of deterioration by weathering, four coals, representing distinct types, were placed in storage and carefully sampled at regular intervals. New River coal from the Sun mine, Fayette County, West Virginia, (a smokeless coal, containing about 20 per cent. volatile matter and largely used by the Navy Department), was stored in small lots—50 lb. portions, ¼-inch coal, in boxes submerged under sea-water, and 300 lb. portions, both ¼-inch and run-of-mine, exposed to the air. All of these small lots, thirty-five to forty in number, were made up out of one large lot, well mixed.

Pocahontas coal of a type similar to that from New River, was stored in a 120-ton pile in the open air on the Isthmus of Panama. In order to study the deterioration in gas-making qualities of Pittsburgh gas coal it was stored in 5-ton outdoor open bins at Ann Arbor, the experiment being conducted in coöperation with the University of Michigan. Subbituminous coal, or black lignite, from Sheridan, Wyoming, was stored at that place in outdoor bins which held from 3 to 6 tons each. Duplicate samples were taken from each lot at each sampling, and an endeavor was made to obtain as nearly as possible a representative sample of the entire lot, both of the weathered and unweathered portions.

Some variation in ash and sulphur was unavoidable in duplicate samples, but the effect of these variables is eliminated in calculating heat values to the basis of actual coal substance. Small lots and a comparatively fine state of division were conditions purposely adopted with the New River coal in order to make the tests of maximum severity.

Heat Loss Less Than 1 Per Cent. Per Year

A summary of the results obtained thus far is given in Table I. The values given are averages of at least two duplicate samples, which showed a variation in most instances of not more than 54 B.t.u.

With New River coal in two years the largest loss was 1.8 per cent., this being at Key West, Fla., and in one year 0.9 per cent. at the same place.

With the New River and Pocahontas fuels there was no apparent slacking of lumps or physical deterioration in the run-of-mine, although no actual measurements of such a change were made. In all cases the ¼-inch crushed coal exposed to the weather deteriorated in heat value more than the run-of-mine, and deterioration was greater in warm climates.

Effect of Weathering Over-estimated

These results, while they cover only a few coals, appear to show that the effect of weathering on the heating value of Appalachian coals is small, not more than 2 per cent. in two years, and that the effect has been by many authorities greatly over-estimated.

In this connection it is of interest also to note a few reports of other tests which seem to corroborate in some degree the results of the tests just described. An analysis was made recently of Pocahontas coal sampled by the Navy Department from a stock which had been kept under cover for 4 years at Sitka, Alaska.

The calorific value of the moisture-, ash- and sulphur-free coal substance was 15,714 B.t.u. as compared to an average for fresh Pocahontas coal of 15,826 B.t.u., showing a loss in 4 years of about 0.7 per cent.

TABLE I. DETERIORATION OF COAL

Calorific values in B.t.u. of the coal substance, moisture-ash-sulphur-free coal before and after storage.

Kind of Coal	Storage Conditions	Place	Calorific Values: As Stored	After 3 Months	After 1 Year	After 2 Years.	Loss Per Cent.: In 1 Year.	In 2 Years
New River, W. Va. (*a*)	¼" coal under sea water.	Portsmouth, N. H	15,770 15,773	.....	15,766	15,714	0.00	(*g*)0.39
	¼" coal under sea water.	Norfolk, Va.....	15,757 15,790	.....	15,773	15,727	0.00	(*g*)0.40
	¼" coal under sea water.	Key West, Fla....	15,744	.....	15,718	15,786	0.18	0.00
	¼" coal under fresh water.	Pittsburgh, Pa....	15,754	15,772	15,748	15,768	0.00	0.00
	¼" coal exposed to air indoors.	Portsmouth, N.H.	15,802	15,728	15,736	15,676	0.42	0.80
	"	Norfolk, Va.....	15,752	15,736	15,725	15,691	0.18	0.39
	"	Key West, Fla....	15,757	15,710	15,617	.....	0.90	.....
	"	Pittsburgh, Pa....	15,784	15,725	15,694	15,696	0.57	0.56
	R. O. M. coal exposed to air indoors.	Portsmouth, N.H.	15,757	15,764	15,746	15,721	0.00	0.23
		Norfolk, Va.....	15,737	15,775	15,705	15,705	0.21	0.21
	"	Key West, Fla....	15,741	15,719	15,678	.....	0.40	.....
	"	Pittsburgh, Pa....	15,755	15,764	15,732	15,737	0.13	0.11
	¼" coal exposed to air outdoors, uncovered.	Portsmouth, N.H.	15,734	15,714	15,662	15,613	0.45	0.77
		Norfolk, Va.....	15,707	15,676	15,599	15,525	0.69	1.16
		Key West, Fla....	15,730	15,698	15,624	15,466	0.68	1.85
	"	Pittsburgh, Pa....	15,773	15,707	15,660	15,597	0.72	1.12
	R. O. M. coal exposed to air outdoors, uncovered	Portsmouth, N.H.	15,795	15,779	15,768	15,709	0.18	0.60
		Norfolk, Va.....	15,737	15,741	15,696	15,671	0.27	0.55
		Key West, Fla....	15,754	15,674	15,700	15,538	0.34	1.29
		Pittsburgh, Pa....	15,754	15,732	15,689	15,653	0.41	0.64
Pocahontas, Va.	120-ton pile, R. O. M. coal outdoors.	Panama.....	15,829	15,817	15,772	.....	0.36	.....
Pittsburgh bed.	4 tons R. O. M. coal, in open bin, outdoors.	Ann Arbor, Mich..	15,574	(*b*)15,370	15,347	.....	0.18	
			15,574	(*c*)15,395	15,350	.....	0.16	0.00
Sheridan, Wyo. (*e*) Sub-bituminous.	R. O. M. open bin 5 feet deep.	Sheridan, Wyo....	13,266	12,913	.....	(*f*)12,843	....	(*d*)3.19
	R. O. M. closed bin 5 feet deep.		13,266	12,964	.....	(*f*)12,769	....	(*d*)3.75
	R. O. M. closed bin 15 ft. deep.		13,266	13,145	.....	(*f*)12,568	....	(*d*)5.26
	Slack, closed bin 15 ft. deep.		13,239	12,899	.....	(*f*)12,582	....	(*d*)4.96

(*a*) Heat value of representative mine sample of this coal, moisture-ash-sulphur-free, 15,782 B.t.u.
(*b*) After six months' storage, entire lot in bin.
(*c*) After six months' storage, upper 6 inches at surface of bin.
(*d*) Per cent loss in two years and three quarters
(*e*) Each bin contained 5 to 10 tons.
(*f*) After two years and three quarters.
(*g*) On the basis of the original value of the same test portion (not that which was sampled at one year).

Injury Severe Neither in Heat Values or Condition

There was practically no loss in underwater storage. Pocahontas coal at Panama lost 0.4 per cent., and the Pittsburgh gas coal at Ann Arbor practically nothing in one year's weathering.

The Wyoming coal in one of the bins lost 2½ per cent. in the first three months and over 5 per cent. in two and three-quarter years. It had slacked badly on the surface, but this did not penetrate more than 12 to 18 inches.

Room-o-meter

The instrument described in this article has been in use in the offices of several coal companies, and has proved its worth as a time-saver in saving in layout work.

The sketch, Fig. 1, displays, as the name implies, a combined table and square intended to facilitate a draftsman's work in plotting quarterly or semi-annual mine surveys. The cuts clearly show the design of the instrument. It is preferably scored on a piece of transparent celluloid about $\frac{1}{16}$ in. thick.

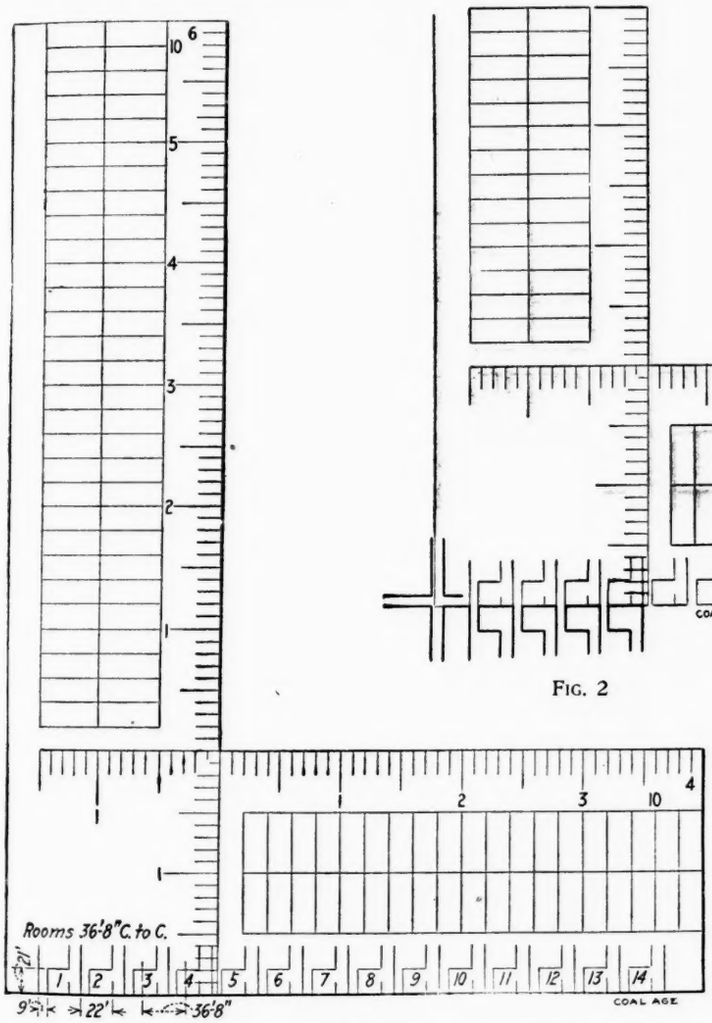


FIG. 1

The graduations are placed on the side next to map, and constitute the two scales extending along each inner leg, and across the adjacent leg. The divisions are in tenths of an inch, the zero reading of each being located at the intersection of the two inner edges of angle.

Alternate graduations have been extended part way across each leg, between parallel lines. These extensions will serve to place either scaled edge at right angle with a working line from which point it is desired to set off a given distance.

The graduations along the lower edge of square represent the spacing of rooms along an entry. On this particular scale, centers of rooms were made 36 ft. 8 in. (room neck 21 ft. deep), which is by no means a fixed or universal spacing. This dimension will vary somewhat in any particular mine and possibly greatly with different mining companies.

Fig. 2 shows the manner in which a room neck may be laid off along entry when standard room centers are maintained. Only a portion of the scale is shown.

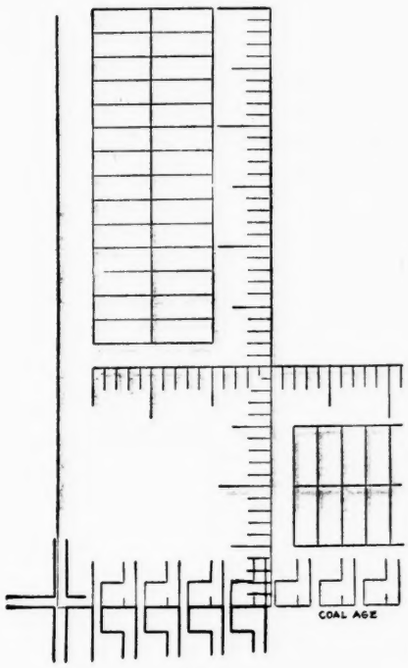


FIG. 2

The method of laying off depth of room is shown in Fig. 3. In this instance, the face is being drawn 149 ft. from center line of entry; the width of room is 29 ft. The position of lines forming angle *AOB* will indicate position of scale to draw closing up side of room.

While not in exact accordance with the name assigned to this instrument, it will be seen that by lengthening the scales on this instrument to, say, 10 or 12 in., certain classes of work encountered by engineers will be greatly facilitated.

For instance:

(1) In coördinate plotting, one adjustment of the scale would indicate both latitude and departure in contradistinction to the combined use of scale and triangles ordinarily used.

(2) In cross-section work, it is quite apparent that the same advantage may be gained in determining distance from center line and elevation of points by a single adjustment.

(3) In contour work, the necessary operations in interpolating contours between known elevations can be greatly reduced.

(4) In topographical work, the necessary operations incident to the transfer of locations from note to map employing either sine and cosine, or contangent methods will be reduced to a minimum.

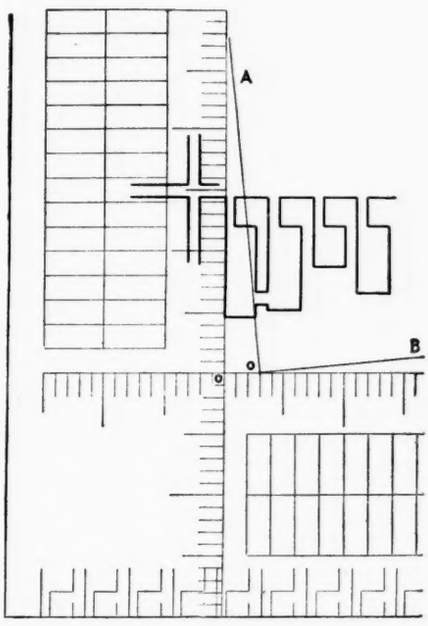


FIG. 3

(5) The scale is especially adapted to the plotting of angles, in that one adadjustment will measure the hypotenuse of sine and cosine and a single additional adjustment will measure the hypothenuse of the angle, and give a direct check on the preceding operation.

Good briquettes should have coherence, hardness, toughness and density. Almost any desired degree of coherence may be obtained by increasing or decreasing the amount of pressure. The loss from breakage incidental to transportation and use should not exceed 5 per cent. Briquets should be hard enough to withstand an atmospheric temperature of 140 deg. F., but if too hard they prove brittle under rough handling. A high melting-point binder usually insures a hard briquet. The density of briquets should range from 1.1 to 1.4; it increases with the amount of pressure applied.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

No man in America has attained to greater eminence in the science of geology, as applied to coal deposits, than I. C. White, for many years state geologist of West Virginia. His fame has passed the borders of his own country, and the master scientists of foreign lands have been quick to recognize his ability and honor the genius of this great American.

Born in Monongalia County, West Virginia, in 1848, Doctor White has never really divorced his residence from the place of his birth. Although his life was begun in a humble manner, he succeeded in securing a thorough education, graduating from the West Virginia University with the degrees of A.B. and A.M. in the year 1872. He received the degree of Ph.D. from the University of Arkansas, in 1882, and took a post-graduate course in geology and chemistry in 1876-7, at Columbia University.

From 1875 to 1884, he was assistant geologist on the Second Geological Survey of Pennsylvania, being the author of eight volumes of the reports of that survey. From 1877 to 1892, Doctor White was professor of geology in the West Virginia University, and from 1884 to 1888 he was one of the assistant geologists of the U. S. Geological Survey. In filling this latter position, he prepared and published Bulletin 65 on the Stratigraphy of the Appalachian Coal Field.

In 1892 he resigned his position at the University to take charge of a large petroleum business, which he had developed for himself and associates, through scientific discoveries made in connection with his studies of the occurrence of petroleum, natural gas and coal. From 1892 to 1907, he was treasurer of the Geological Society of America; in 1896-7 he was vice-president of the American Association Sec. E (geology); in 1897 he was delegate to the International Geological Congress, held in St. Petersburg, and in 1910 was a delegate to the same congress held in Paris.

Doctor White has been state geologist of West Virginia since 1897, and has prepared and published five of the volumes of the reports, viz.: Vols. I and I (A) on Petroleum and Natural Gas, and Vols. II and II (A) on Coal, and Bulletin Two, on Levels and Coal Analyses. He has also supervised and edited the publication of eight other volumes, published by the West Virginia Geological Survey, which were prepared by his assistants.

In 1904-6, I. C. White visited Brazil at the request of the Brazilian government to make studies and an official report on the coal fields of South Brazil. This report, a large quarto volume, with numerous illustrations, of the Brazilian coal fields, was published in both English and Portugese in 1908.

I. C. WHITE

At the White House conference of governors, in May, 1908, President Roosevelt asked Dr. White to be the second speaker on the program. The subject of his address was, "The Waste of Our Fuel Resources." This paper, in connection with another address before the American Mining Congress, at Pittsburgh, in December, 1908, on "The Barren Zone of the Appalachian Coal Field," has greatly aided the conservation movement inaugurated by President Roosevelt.

Although a busy man, he finds time to take an active interest in civic affairs, being the vice-president for West Virginia of the International League for Highway Improvement, and president of the West Virginia State Board of Trade. During the recent visit of President Taft to Morgantown, in connection with the inaugural ceremonies of Doctor Hodges, now president of the West Virginia University, Doctor White was unanimously selected by his fellow citizens to entertain President Taft and his party.

Like most boys born of farmer parents and who spent the early days of their youth tilling the soil, I. C. White started life with a serious purpose in view and a grim determination to win a place for himself among the world's doers. Always of frugal and absteminous habits and possessing a keen aversion to ostentation and show, he has "laid by" a considerable quantity of assets in the way of material wealth. There has been little of romance, or so called "luck" in the story of his life, his rise having been due entirely to diligent application and undaunted persistence.

He has erected and owns several handsome business blocks in the City of Morgantown, and, in addition, has considerable industrial holdings of a remunerative nature, but all success which has visited him in whatever guise has failed to change the simple modesty and kindly demeanor of the man. His whole life indicates his belief that "lowliness is the base of every virtue, and he who goes the lowest builds the safest." His modesty, however, is not that effected kind which demands a denial of merit, but rather of the sort that is entirely compatible with a due estimate of your own true worth.

Political honors seldom come to men who do not seek them, but Doctor White without effort or solicitation on his part has been urged repeatedly to become the candidate of his party for various high offices in his native state. In all cases of this kind he has quietly suggested that he cannot forsake his life's work, even to please his friends. As a consequence of this close adherence to a chosen line of endeavor, the extent of his political activities has been confined to numerous pleas to the state legislators on matters pertaining to conservation of resources.

Few men know that a great part of the work which has been done by the West Virginia Geological Survey was carried on at the personal expense of Dr. White. Practically all his time and work for the state have been given gratis, and it is because of this generosity, coupled with deep love for his native Commonwealth, that the West Virginia Survey is a model department, whose results are far more complete and infinitely superior to the work accomplished in most other states.

West Virginia can point to no man in any line of endeavor with a cleaner record, a more admirable character, or who has brought greater renown to its incomparable hills than Dr. White, of Morgantown.

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Sec'y.
505 Pearl Street, New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin, N. W. 7.

FLOYD W. PARSONS, Editor.

Correspondence suitable for the columns of COAL AGE solicited and paid for. Name and address of correspondents must be given—not necessarily for publication.

Subscription price $3 per year in advance for 52 numbers to any post office in the United States or possessions, and Mexico. $4 to Canada. $5 to any other foreign country.

Subscribers in Great Britain, Europe and the British Colonies in the Eastern Hemisphere may send their subscriptions to the London office. Price 21 shillings.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday of week prior to date of issue.

Entered as second-class matter, October 14, 1911, at the post office at New York, New York, under the act of March 3, 1879.

Cable Address, "Coage," N. Y.

CIRCULATION STATEMENT

Of this issue of Coal Age, we will print 8500 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

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COAL AGE

West Virginia, Past and Present

When West Virginia first started to be a coal producer, the railroads demanded so much payment for freight that the industry was nipped in the bud. For years, West Virginia was an "economic blunder," tempting and tantalizing. It promised much and gave little. Coal land was cheap, wages miserably low, but still no money could be made.

After a while, better transportation rates were secured, the railroads profited by tariffs which left them a fair margin and yet permitted the business of mining coal to succeed. Wages were lower than elsewhere, but as coal at low prices forced its way freely on the market, and as labor was scarce, work was steady and every man on the whole got a fair number of cars.

Thus as often happens, lower day- and piece-wages were balanced by greater activity. The farmer, who had made a highly penurious living out of his hillside farm, who was drifting backward rather than forward in his secluded cabin, prided himself on the new industry which paid him more liberally than farming could ever have done and which brought him in touch with a world, hitherto shut out by the impassable mountains. The foreigners also were receiving more than they did in the countries from which they had come.

West Virginia began to progress and by virtue of lower freights per mile, more moderate royalties, self-draining coal and deposits unequalled in the United States for their purity, it drove Pennsylvania and Ohio out of many of the markets which these states regarded as their own.

The only fleck on the sky arose from the competition which began to develop between operators in different parts of the same state. It was clear that rivalry between intrastate fields had put a sharp crimp in the prosperity of West Virginia and this occurred just at the time when the industry was assailed in the courts. The rates of lake-coast traffic from Pittsburgh were reduced 10c. per ton while that of the competing regions of West Virginia remained unchanged.

It is useless to make the statement that the coal of West Virginia costs as much to dig as that of Pittsburgh. A solitary mine might show a high range of cost, but on the whole the West Virginia fields have every advantage over their competitors in the matter of extraction cost, a difference which we can hardly explain away by recognizable inequalities in thickness and cleanness between the coals of West Virginia and those of Northern States.

This difference in cost is due almost entirely to the low prices paid to labor and to the amiable attitude of the laboring men to capital. The reasons for this condition have already been set forth in sufficient detail. For these reasons the miners have not felt disposed to strike or suspend work.

It is true, therefore, that the pressure for higher wages comes and has come largely from without. The wage earner of Pennsylvania, Ohio and Illinois has heard reiterated statements from the operator. "We cannot now compete with the lower-priced labor of West Virginia, how then can we stand for the increase in wages which you so unreasonably demand." "An equal rise per cent. in West Virginia with that which we grant will increase the competition against us 2c. or 3c. per ton." Often rising to an epigram the operator would say, "Either accept a reduction here or go to West Virginia and accept it there."

We are not surprised, therefore, that the union is striving to break its way into West Virginia and that the outside invasion is more forceful than the internal uprising, nor do we think it unlikely that the union, seeing conditions as they are and knowing how the Pennsylvania and Ohio operators feel, have been inclined to seek help from a source so likely to aid them.

But after all is said, this unionizing of West Virginia means nothing more nor less than its ruin. Some operators have declared that they would shut down their

mines for a year rather than make any concession. We believe them; for they might as well close down a year before peace is established as lay idle for a year afterward. It is a choice of alternatives. A readjustment of the wage would shut down the mines in many districts of the state.

The industry is built and buttressed on the conditions which the Union and the Commerce Commission are trying to remove. If these are overthrown, the industry becomes an economic blunder and who will suffer most if that fact is determined? Like all economic ill-adjustments, as soon as they are cut off, economic ruin follows.

For example, industries bolstered by a tariff cannot be relieved of that support without being given due time for readjustment. The whole country is thrown into idleness and credit is overthrown by rapid reductions in the taxes on foreign imports even when the industries protected are in nowise entitled to such support. Properties one day valuable are by the operation of basal laws rendered valueless at the stroke of a pen.

We think the West Virginia miners will hesitate to take steps of a radical nature. They will remember that if their pay is not equal to that in neighboring states, it looked good to them when the locomotive first awoke the echoes of their hills 10, 20 or 30 years ago and that their wages have advanced continually ever since. They might have opposed the introduction of railroads, but they did not have a complaint as to the wage they afforded. Moreover, the negroes and foreign employees are receiving a larger wage in West Virginia than in any place where they have worked hitherto.

And the operators will learn, perhaps, that their wage scale cannot be fixed in perpetuity below that of other states. A piece of constructive wisdom would be to endeavor to build up coal-consuming industries near at hand. There is excellent coking coal and yet ovens throughout the state are normally idle. The slack which should be coked within them is piled over them for storage.

The wealth of West Virginia dammed back by a slight reduction in the profit of mining coal might flow toward industries which would make the state almost free of the chances of freight rates and wage scales because it would become in a larger measure a self-sufficing community. Up to the present time, the wealth that has been created by the exploitation of West Virginia's resources has gone largely to enrich the people of other states.

Concrete Mine Structures

It seems definitely determined that not only the reinforcement of ferro-concrete construction is subject to electrolysis, but the concrete also. The material in which the rods are embedded serves as a veritable solid electrolyte and the bars and other steel shapes as the cathodes and anodes.

Nor does it seem necessary that the reinforcement shall be near the surface; when the rods are buried five or six inches from the face of the concrete, the action is the same, showing that the effect is purely that of electrolysis.

The silicates of calcium and aluminum decompose, the silicic acid appearing with the oxygen at the positive pole and the hydroxides of calcium and aluminum at the negative.

As the positive rods attract the oxygen atoms, they are soon attacked and become swollen with oxide, bursting the concrete adjacent to them. It appears that only a small voltage is necessary to produce the effect, for when water is present 1½ volts will produce marked electrolytic action.

The dampness of a wall may be slight and not enough to show that water is passing through the concrete. Nevertheless, there may be moisture enough to accelerate the action. Furthermore, the presence of acids, alkalis and salts favor electrolysis.

These actions are vouched for by Harold P. Brown in a recent issue of *Engineering News* and he states that not only reinforced concrete, but the bulk concrete of foundations may also be attacked by electric current.

Such facts should not be overlooked in the design of mine structures, especially where electricity is used. Stray current from wires improperly insulated, or from ground wires may serve to electrify some of the reinforcement and cause oxidation of the rods and a bursting of the concrete.

The conditions around a washer or storage building are favorable to electrolysis, for the waters escaping from the coal are usually extremely acid and these waters keep large portions of the building constantly soaked.

In these structures, or near them, dynamos may be found and these are often grounded to water lines. If these lines pass through the concrete or near it without insulation, the pipes, the reinforcement and the imbedding material may be attacked. In any event the return current from the various machines is liable to pass through the foundations on its way.

Coal Breakage

The use of an adjustable retarder seems to be the solution of many of the problems of coal breakage around bunkers, ships holds, bins and breakers and the article on "Coaling Ships without Breakage," occurring on another page of this issue, has a broader outlook than the title suggests.

There is something positive about the action of such a device. The motion of the coal is communicated to the machinery, and the speed of the machine can be regulated within close limits.

On the other hand, the delivery of coal over a chute is dependent on the wetness or dryness of the coal, its purity, its shape, the temperature and dryness of the air, the length of fall, the recent or delayed use of the chute, its exposure by night and the perfection of its surface.

With a retarder there is no need to worry about such details, be the coal wet or dry, large or small, clean or dirty, the speed is the same and there is no fear that the retarder will fail to operate.

The 128 coal seams of the Couchant le Mons basin, Belgium, are much interrupted by breaks, faults, dikes, etc. They vary in thickness from 2 to 4 ft., the former figure being a fair average for all seams. They are found at a depth of 2900 ft. Some of the seams are excessively firey, gas always being present in places not well ventilated; they are also dusty. The dust is not sprayed or watered, but reliance is placed on efficient safety lamps and the maintenance of strict precautions under conditions of danger. The lamp chiefly used in these dangerous workings is the Mueseler. The miners have learned to be most careful in handling their lamps and any neglect or carelessness is severely punished.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Expansion Bit for Drilling Coal

Referring to the description of an expansion bit, for drilling coal, COAL AGE, May 18, p. 1050, permit me to say that I do not think such a bit would be practical for use in the hard-coal or anthracite mines, for a number of reasons.

First, we use black powder, altogether, in blasting coal. This powder comes in paper cartridges. The cartridge that would go in the hole would not fill the back part of the hole if the diameter of the hole were enlarged. The cartridge would have to be broken to allow the powder to fill that part of the hole. This would not answer if the hole was wet, as it would spoil the powder.

Second, owing to the coal sticking to the roof, we, in most cases, drill the holes upward. If the cartridge were to be broken, much of the powder would run out of the hole.

Third, another difficulty would be found in tamping the hole. The tamping bar should have a head 1½ in. in diameter, but this would not fill the hole where its diameter is enlarged; and when the cartridge is broken some of the powder would get behind the head of the tamping bar and prevent its being pulled out of the hole; or perhaps the powder would be exploded in attempting to draw out the tamping bar.

The only hole where I think such a bit could be used is a down hole in which the powder would run to the back end of the hole. In this case, such a bit would be all right.

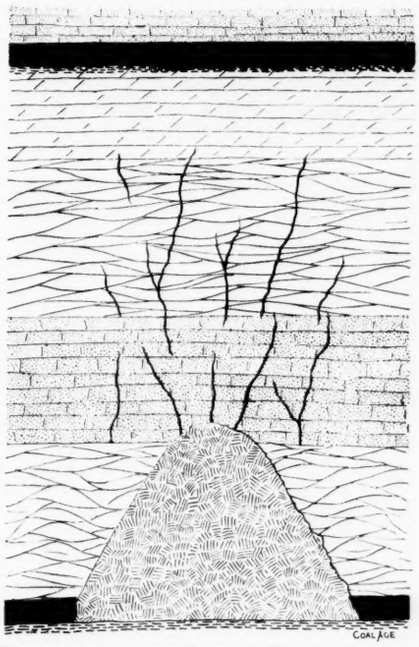
THOMAS R. PIERCE.

Scranton, Penn.

Working an Underlying Seam of Coal

Referring to the inquiry of Thomas Good, in regard to working an underlying seam of coal, COAL AGE, July 27, p. 127, I am of the opinion that it would be perfectly safe to work out the lower seam completely. Under the given conditions, I do not believe this would interfere with the successful mining of the upper seam at a later period.

The section given by Mr. Good shows practically 175 ft. of intervening strata. Experience has shown that loose or broken material occupies more space than the same material in the solid. Assuming that the broken material occupies 10 per cent. more space than the same material in the solid, and taking the thickness of the seam of coal as 6.5 ft., the rock strata would be broken to a height of $6.5 \div 0.1 = 65$ ft. above the floor of the coal seam. On this basis, we should expect that the broken rock would choke the opening at this height above the floor, and form a support for the remaining overlying strata, as illustrated in the accompanying sketch. There will be



CROSS-SECTION OF STRATA SHOWING THE EFFECT OF EXTRACTING THE COAL

probably, some cracks extending up through the strata to the floor of the upper seam; but, judging from the nature of the strata, much of which is hard sandstone, the chances of these cracks are very remote.

R. Z. VIRGIN.

Johnstown, Penn.

[In his reply to this question, our correspondent assumes that when the coal is extracted, the overlying rock strata will fall into the opening in a broken loose mass of rock, which is seldom the case in practice.

The extraction of the coal in a seam is followed with a general subsidence or settlement of the roof strata overlying the seam. Great cracks or fissures form in the strata, and the roof rock falls in large pieces. While it is true that these large pieces of rock occupy more space than they did in the solid, they will not fill the space and choke the opening to the same extent that loose broken material does. In many cases, the subsidence following the extraction of the coal is general, and its effect is manifested much higher in the strata than is shown by the calculations suggested by our correspondent. However, as we have stated previously, there is little fear that the extraction of the coal in the lower seam, if properly performed, will interfere seriously with the mining of the coal in the upper seam. This conclusion is based on the thickness of the intervening strata and the nature of the rock.—EDITOR.]

Abandoned Places in Mines

I was interested in the question of the Indiana mine superintendent relative to abandoned places in mines and note the suggestion by John Sutton, COAL AGE, Aug. 3, p. 161, that a majority of mine superintendents and foremen prefer to wall off abandoned places in the mine so as to economize the air for other sections of the mine, rather than as a measure of safety. I cannot see where his theory comes in.

If the places are worked out, and caved in, it will take, practically, the same amount of air to dilute and render harmless the noxious gases emitted from those places, as it did before caving; in fact, the probabilities are that, owing to the cave, more gas will be liberated than before; consequently, a corresponding increase of air would be required.

In replying to such questions, we should be careful to impart the right meaning, and state clearly whether the abandoned parts are abandoned temporarily, for certain reasons; or whether they are worked out and permanently abandoned. The question of marketing a particular quality of coal, may depend on its location, its steep haul; or the quantity of gas in the strata, any or all of which conditions may improve later on. It would not be good foresight therefore to cave in these places, unless they are worked out. The average mining man, makes a difference between an abandoned place, and a worked out portion of a mine.

Mr. Sutton has overlooked the fact that the quantity of gas given off by the coal seam would more than likely be increased by breaking the strata overlying the seam; and while the total standing area might be reduced somewhat by the caving, and the loose rocks filling up the space; yet these would not fill the space completely,

and the standing gas would be there in as great quantity as before, and possibly be a stronger firedamp mixture.

Under these conditions, if abandonment is temporary, it would be more economical to build bulkheads and seal off the gases or the places containing them.

If, however, the plan of caving is decided upon, it would be better to bore a hole from the surface and allow the gas to escape. Then, whenever the difference in pressures would permit, a portion of the air would pass up the borehole, carrying with it the gas. But if, on the other hand, the movement of cars and other causes draw this mixture from the edges of the falls, so that it does not pass up the borehole, the entrance to the place should be closed. The gas being one-half the weight of air, will then naturally rise and escape through the hole to the surface. This would obviate the necessity of sending a volume of air around these places and allow more air for the parts of the mine that are being worked.

The mine superintendent does not say that there is much slack coal in the gobs, and I take it for granted the gob is clean, and the chances very remote for a fire caused by spontaneous combustion; but I fear that after the roof strata has been broken (this strata carries more or less coal) the chances for spontaneous combustion will be increased. Under these conditions, I am of the opinion that bulkheading or sealing off these abandoned places, will give better results than caving in the places.

R. Z. VIRGIN.

Johnstown, Penn.

Experience of a Fireboss

Referring to the experience of a fireboss when examining a gassy slope, as told by George T. Main, Republic, Ala., COAL AGE, July 20, p. 93, I offer the following as being, in my opinion, the cause of the conditions he describes:

Assuming that it was necessary to blast the coal in this slope, which was possibly poorly ventilated, the combustion of the explosive used in blasting would generate certain quantities of carbon monoxide (CO) and hydrogen sulphide (H_2S). Each of these gases is extremely poisonous and combines readily with the coloring matter of the blood, which was the probable cause of the derangement of the system and loss of consciousness experienced by this fireboss.

From the statement made in the article, the fireboss went up the return-air course, which was pitching 25 deg., to listen for a knock from the crosscut above, which is also said to have been full of gas. There is nothing said of any ill effects to the miner who went into the crosscut to give the knock. In my opinion, the gases from the explosives did not have the same chance of accumulating in the horizontal crosscut, as they would in a place driven 30 ft. to the rise, on a pitch of 25 deg. The head of the return slope where the fireboss went to listen was an ideal place for the accumulation of any gases generated in blasting. Moreover, the man in the crosscut was on the intake side while the fireboss was in the return.

The action and color of the flame in the safety lamp, I would attribute to a certain percentage of olefiant gas or ethane, (C_2H_4) being mixed with the marsh gas or methane (CH_4). The flame and cap would, also, be influenced by the gases produced by the combustion of the explosive used in blasting; or any finely divided particles of coal dust present in the atmosphere of the place would likewise affect the flame.

J. W. POWELL,
Mine Superintendent,
Columbia Coal & Coke Co.

Coalmont, B. C., Canada.

The Fireboss

I thoroughly indorse the ideas of Indiana Fireboss, COAL AGE, Aug. 3, page 159, and wish to add a few words suggested by his remarks. There is no question but what the fireboss, in many cases, has to examine a territory too large to permit him to do the work as carefully as it should be done.

It has been stated that the fireboss is often called upon to do work that should properly be done by others. In opening up a new mine, it often becomes necessary for the fireboss to help with any work that is to be done. After the mine has been developed sufficiently to employ 100 men, however, I think the fireboss should not be called away from his regular work of examining the mine.

The fireboss should, in many cases, act as an assistant foreman. He is the one responsible for the safe condition of the mine, both with respect to gas and the proper timbering of all working places. In this capacity he should work in harmony with the mine foreman; but, in my opinion, a fireboss should be under the supervision of the state mine inspector, acting for him to secure the safe condition of the mine.

The territory belonging to one fireboss should never be so large that he is unable to give enough time to examine all the working places and give proper attention to the old workings, especially the accumulation of gas on the falls. He should do this work as thoroughly as the mine inspector, so that he will be in a position to give an account of all places examined in his district.

I want to say a mine fireboss is under no obligation to give a wrong report. I believe every practical superintendent would rather have a fireboss give a true report, in every case, for his own safety and that of every employee in the mine. I want to urge all firebosses to be loyal in their examination of the mine, and to render in every case a true report. We must remember we have thousands of lives depending upon this examination and report; besides our own lives and millions of dollars worth of property are at stake. I want to urge upon every fireboss the importance of seeing that gas when present, in any working place, in quantity sufficient to give a cap in the common Davy lamp, is cleared out before workmen are allowed to enter the place with a naked light. This will often prevent a serious accident and save many lives.

The efficiency of a properly designed system of ventilation may be greatly reduced by the incompetency of the person in charge of the same, also leaky brattices, inefficient or dirty airways, trapdoors in place of overcasts, may often reduce the ventilating efficiency from 40 to 50 per cent., thus increasing the cost of the output. It is the duty of the fireboss to see that everything is done to improve the ventilating system in the district of the mine of which he has charge and to suggest any needed changes to secure this result.

JOHN SUTTON,
Fireboss.

West Terre Haute, Ind.

"Bumps" in Mining

The "foreword" in the issue of COAL AGE, July 27, on "Bounces," by A. C. Watts is of considerable interest to operators in this field. "Bumps" as they are called here, have occurred quite frequently in the lower workings of the No. 1 mine, at Carbonado, Pierre County, Wash. The gangway in this mine is about 275 ft. below sea level, and about 1800 ft. below the surface. The seam dips about 35 deg. and the wall rocks are solid; in fact, the gangway is not timbered at all. The methods and conditions of mining are the same here as noted by Mr. Watts, in his article. The "bumps" occur generally when the pillar is about half drawn, and in nearly every case the floor breaks along the angle or point of the pillar.

I have always held that the "bumps" are due to overhead pressure; but there seems to be a strong belief in the gas-pressure theory, among operators here, since this particular seam is "gassy." Mr. Watt's remarks on the subject are therefore of timely interest.

WILLIAM F. JONES.

Tacoma, Wash.

It is estimated that the unworked areas of the Paleozoic coal fields of New South Wales contain 150,000,000,000 tons of coal in seams 3 ft. thick or over, and at a depth of not more than 4000 feet.

Fifth Root of Numbers

By E. L. Leblanc*

I noticed in Coal Age, Aug. 3, p. 161, Charter Member asks for a method of extracting the fifth root of a number. In reply I would like to give the following as a very simple and practical method for finding the fifth root. It is as follows:

Find the five highest numbers that multiplied together will approach most nearly the given number. To do this, find two consecutive numbers whose fifth powers shall embrace the given number; that is to say, the given number will lie between the fifth powers of the two numbers found. Take the higher number four times as a factor and multiply the resulting product by the lower number. In other words, take the higher number four times as a factor and the lower number once as a factor. If the resulting product of these five factors is greater than the given number, take the higher number three times and the lower number twice, as a factor. Continue thus to reduce the number of factors of the higher number and increase the number of factors of the lower number until the product of the five factors is less than the given number. Then, add the five factors so found together and divide their sum by 5; the quotient will be the fifth root of the number to one decimal place.

If two decimal places are desired, divide the given number by the fourth power of the root just found to one decimal place, and add the quotient to four times the said root. Divide this sum by 5, and the quotient will be the required fifth root to two decimal places.

Example—Let it be required to extract the fifth root of 23,415.

Find the fifth power of a number, taken for trial; thus, taking 8,

$$8 \times 8 \times 8 \times 8 \times 8 = 32{,}768.$$

This number being greater than the given number, try 7; thus,

$$7 \times 7 \times 7 \times 7 \times 7 = 16{,}807.$$

This number being less than the given number, the required fifth root lies between the two numbers taken.

Now, to find the fifth root to the first decimal place, proceed as follows:

$$8 \times 8 \times 8 \times 8 \times 7 = 28{,}672.$$

This number being greater than the given number, try again, thus,

$$8 \times 8 \times 8 \times 7 \times 7 = 25{,}088,$$

which is still greater than the given number. Therefore, try again,

$$8 \times 8 \times 7 \times 7 \times 7 = 21{,}952,$$

which is less than the given number. The fifth root of the given number to one decimal place is, therefore, $(8 + 8 + 7 + 7 + 7) \div 5 = 7.4$.

To find, further, the fifth root to two decimal places, divide the given number by the fourth power of the root already found; thus, $23{,}415 \div 7.4^4 = 7.8$. Add this result to four times the root to the first decimal place and divide by 5; thus,

$$\frac{(4 \times 7.4) + 7.8}{5} = 7.48$$

Therefore,

$$\sqrt[5]{23{,}415} = 7.48$$

To extract the fifth root of a decimal number, it is only necessary to complete the decimal by the addition of ciphers necessary to make five decimal places. Then, discard the decimal point and treat the entire number in the manner previously explained, pointing off one decimal figure in the root so obtained.

Example—Let it be required to find the fifth root of 2.58. First, complete the decimal by the addition of three ciphers and discard the decimal point, giving the number, 258,000. Since this number contains six figures and the fifth power of 10 is 100,000, it is evident the trial numbers taken must be greater than 10. Try 12; thus,

$$12 \times 12 \times 12 \times 12 \times 12 = 248{,}832.$$

Since this result is very slightly less than the given number, the required root, to one decimal, may be assumed as 1.2; and to find a second decimal figure, work and time will be saved by assuming the next figure to be 1, and finding the fifth power of 1.21; thus, $1.21^5 = 2.5937$, which is slightly in excess of the given number.

If a closer result is desired, it is possible to obtain this by following, in detail, the method previously described. In extracting the fifth root of a decimal, it is necessary to point off the final result in accordance with the number given. By following the method, in detail, the fifth root of 2.58 is found to be 1.2088.

This method is one of the most interesting and practical methods in use. Next to the use of logarithms, it is the simplest and most accurate of any I have seen.

*Blairmore, Alberta, Canada.

Electric versus Compressed Air Haulage and Pumping in Mines

By Henry McCluskey*

The kind of haulage used in a mine will depend on the equipment, air or electricity. I have had practical experience with both, and I find that electricity is the most efficient and gives the best results. It is, in my opinion, better to equip the mine with electricity than with air, because it is easily handled for haulage, pumping and coal cutting. I have always gotten better results in hauling with the electric locomotive than with air locomotives; and I find the electricity is cheaper and more reliable than any other kind of haulage.

The up-keep of the main-haulage road is an important factor that is often overlooked by the management. There should be generally, a track gang, at work much of the time on the main road; and if this is done there will be little trouble in haulage. All haulage roads should be well drained, as water getting over the track delays the motor and the motorman has to use sand at these points, which causes unnecessary delay and waste of sand.

Another important factor is a good class of pit cars. I prefer the single bumper and stiff hitchings, because they give better results than double bumpers and chain hitchings. Chain hitchings are the cause of many wrecks, and the jerk of the cars scatters coal along the motor road. If the grade is in favor of the load, the trip is more steady and when the motorman applies the brakes there is less danger of a smash up when stiff hitchings are used. Also, with single bumpers, the cars are not so ready to lock, as with double bumpers.

The work of hauling from the face and butt entries and rooms to the main partings, where the trips are made up, is important and should receive careful attention. There are many mines in this district using what is called gathering, electric locomotives; but I am not in favor of these as it increases the cost of hauling and takes too many trackmen to keep up the road. Two men are required to operate one locomotive, and the amount of coal hauled does not pay, except, perhaps, in a large mine. I have found that mule haulage is more easily handled and cheaper in the gathering haul, besides being safer and more reliable, as there are fewer breakdowns. If the roads are kept in fair shape, with good mules and drivers there should be little trouble in getting good results in the gathering haul.

In regard to pumping, I find that the electric-driven power pumps give better results than either air or steam pumps, as they are more efficient and give less trouble. Moreover, the current can be obtained from the machine lines; and I find that the portable vertical-triplex-plunger pumps are cheap, give good satisfaction, and are reliable at all times. One man can look after several of these pumps, and keep up the pipe lines leading to the working places.

Of course, when the main lines must be advanced more help is required. For handling a large body of water, I find that the centrifugal pump gives good service with little expense for repairs. It takes, however, a good practical man and one that understands something about machinery, to handle this class of pumps; as they are sensitive and may give the attendant some trouble until he understands how to handle them. But, all things considered, I find that this class of pump gives great satisfaction in handling a large body of water.

*Mine foreman, Pittsburgh Coal Co., Gradatim, Penn.

Inquiries of General Interest

Questions are not answered unless accompanied by the name and address of the inquirer. This page is for you when stuck—use it

Taking a Timber Down a Shaft

Having decided to install steel timbers in one of our pump rooms in the mine and requiring a length of 25 ft., this being the width of the room, the material was purchased and brought to the shaft. The shaft was rectangular, 5 ft. 8 in. by 10 ft. 6 in., in cross-section. The height of the entry or the headroom, at the foot of the shaft, was 6 ft. After lowering one of the timbers down the shaft it was found to be impossible to get it from the shaft into the entry, on account of its length. It would not pass under the collar-beam where the roof of the entry joins the face of the shaft.

I want to ask if there is any formula that will enable me to calculate the greatest length of a timber that can be taken down a shaft and into the entry. Assume the shaft is vertical and the floor of the entry level.

MINE FOREMAN.

Hazelton, Penn.

Allow the stick or timber to slip down the shaft and into the entry, keeping its two edges *ab* and *ef* in the end plane of the shaft and the side plane of the entry, respectively, as shown in plan, in the accompanying sketch. Also, keep the upper surface of the timber tangent to the edge of the collar beam *op*, projected at *n*, in elevation. The plane of the upper surface of the timber will then be perpendicular to the end plane of the shaft and the side plane of the entry, which correspond.

In this position, consider the timber to be of such length that its lower corner *g* touches the floor of the entry, while the upper corner *c* is touching the back face of the shaft. In the sketch, the timber is shown in elevation, as projected on the vertical end plane of the shaft and side plane of the entry; and, in plan, projected on the horizontal plane of the floor.

Consider, first, the projection on the vertical plane, and suppose this projection to be rotated about the point *n*, until its position is such that any rotation, in either direction about the point *n*, will require an equal movement at each end, in the direction of the projected length. The angle *A* between the projected length and the horizontal, may be called the critical angle. Now, since the arc of rotation at each end is proportional to the projected lengths *x* and *y*, or the distances *nd* and *nh*, we have, under the conditions assumed,

$$x \tan A = \frac{y}{\tan A}; \text{ or } \frac{y}{x} = \tan^2 A \qquad (1)$$

Calling the depth or thickness of the timber *t*, the width of the shaft *W* and the height of the entry *H*, as in sketch,

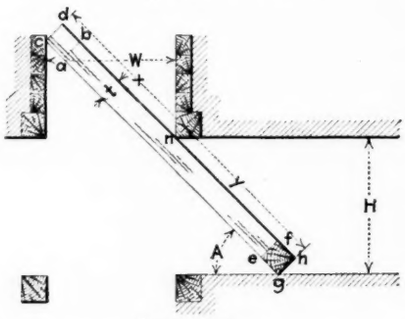
$$W = x \cos A + t \sin A$$

$$H = y \sin A + t \cos A$$

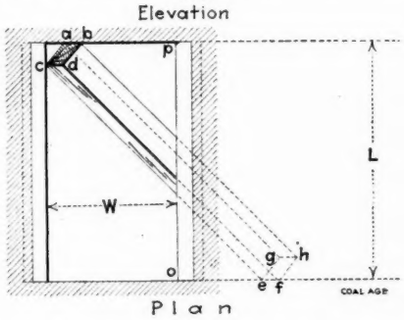
$$\frac{y}{x} = \frac{1}{\tan A} \quad \frac{H - t \cos A}{W - t \sin A} \qquad (2)$$

Now, combining formulas 1 and 2,

$$\tan A = \sqrt[3]{\frac{H - t \cos A}{W - t \sin A}} \qquad (3)$$



Elevation



Plan

Calling the actual length of the timber *l* and its projected length l_1

$$l_1 = \frac{W \tan A + H}{\sin A} - t\left(\tan A + \frac{1}{\tan A}\right) \qquad (4)$$

In finding the greatest length of timber that can be taken down the shaft and into the entry, under these conditions, the first step is to find the critical angle *A*, by trial substitution in formula 3. Then find the projected length of the timber, by formula 4. To find the actual length of the timber from its projected length, it is necessary first, to find the angle that the axis of the timber, or one of its long edges, makes with the vertical side plane or the plane of projection; this angle *B* being measured on the inclined plane passing through the upper face of the timber. This is done by using the following two equations:

$$\tan B = \frac{L - w \cos B}{l_1 - w \sin B} \qquad (5)$$

$$l = \frac{l_1 - w \sin B}{\cos B} \qquad (6)$$

First find the angle *B*, by trial substitution, in formula 5; and, finally, calculate the true length of the timber *l*, by formula 6.

Finding the longest timber that can be taken down the shaft of the dimensions given by our correspondent, the critical angle determined by formula 3, is 45° 40′. The projected length of the timber determined by formula 4, is 14.5 ft. The angle *B*, which the edge of the timber makes with the side plane or plane of projection, measured in the inclined plane of the timber, is 35° 23′, as determined by formula 5. The actual length of the timber, or the longest length that can be taken down this shaft and passed into the entry, as determined by formula 6, is 17.43 ft., or say, 17 ft. 5 in. These results are based on the steel girder assumed as 6 in. wide and 12 in. deep.

Water Supply for Boiler

The tank holding the water supply for a boiler is 8 ft. in diameter on top, 12 ft. in diameter at the bottom and 10 ft. deep. (*a*) If these are the inside dimensions of the tank, how much water will it hold? (*b*) It being necessary to repair the pump and the tank being first filled, how long would this supply of water last when using 40 hp. and heating the feed water to a temperature of 100 deg. F.?

FOREMAN.

Athens, Ill.

(*a*) The cubical contents of the tank is

$$0.7854 \frac{h}{3} \frac{D^3 - d^3}{D - d} = \frac{0.7854 \times 10 (12^3 - 8)}{3 (12 - 8)}$$

$$= 795.872 \text{ cu.ft.}$$

This tank will hold when full 795.872 × 62.5 = 49,742 lb., or 795.872 × 7.48 = 5953 gal.

(*b*) The standard boiler horsepower is the evaporation of 30 lb. of water per hour from a feed-water temperature of 100 deg. F. to steam under 70 lb. gage pressure. Taking this standard, and assuming a gage pressure of 70 lb. at sea level, when using 40 hp. the tank will be emptied in

$$\frac{49,742}{40 \times 30} = 41.45 \text{ hp.}$$

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Examination Questions

VENTILATION, SPLITTING

Ques.—Explain briefly the purpose of splitting the air current in a mine.

Ans.—There are several reasons for splitting or dividing the air current in a mine. They may be stated briefly as follows: (1) A larger volume of air is circulated with the same power. (2) The circulation in the mine is under better control, because the air can be divided so as to proportion the quantity of air to the needs, in each district. (3) A local explosion of gas or dust in one district is not as apt to extend into another district. (4) Purer air is supplied to the working face, because the gases generated in one section are not carried into another section, but pass at once into the main return current and are conducted out of the mine. (5) The air sweeps the working face and circulates through the rooms and chambers at a moderate velocity.

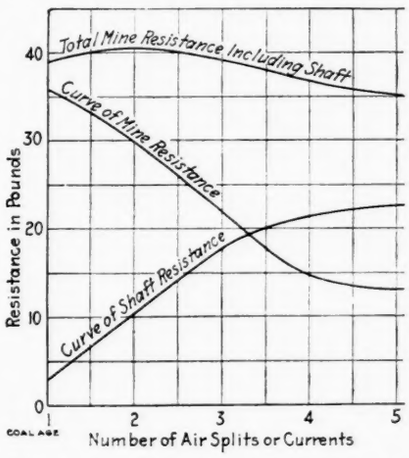
Ques.—Does splitting the air current in a mine increase or decrease the mine resistance?

Ans.—If the air current were split at the entrance of the mine, the power on the air remaining constant, the velocity of the air would not be changed by splitting; and, since the rubbing surface remains unchanged, the mine resistance would not be altered. In practice, however, the main air current must, usually, pass through a shaft or main airway before reaching the point in the mine, where it is to be divided. Where the air is split in the mine, the area of passage is increased, which has the effect of increasing the flow of air. This *increases* the velocity of the air passing through the shaft and main airway, but the velocity in the airways beyond the point of split is reduced owing to the increased area. There being no change in the rubbing surface, the resistance is increased in the shaft and main airway, but decreased in the splits.

By means of higher mathematics it can be shown that the increase of resistance in the shaft and main airway exceeds the decrease in the splits up to the point where the sectional area of all the split airways, or the total split area, is equal to the sectional area of the shaft or main airways. Befond this point, or when the total sectional area in the splits is greater than the sectional area of the shaft or main airway, the resistance in the splits decreases more rapidly than the resistance in the shaft or main airway increases.

Therefore, in answer to the question, "Does splitting the air current in a mine increase or decrease the mine resistance?" it can be stated that splitting the air always decreases the total mine resistance when the total sectional area in the splits is greater than the sectional area in the shaft or main airway; otherwise the mine resistance is increased by splitting.

The accompanying diagram (Fig. 1) represents graphically the resistance curves in a shaft mine where the sectional area of the shaft is double the sectional area of a single split or airway. The diagram shows that the total resistance of the shaft and mine including the splits, attains a maximum when there are two splits; or, as stated above, when the total sectional area of all the splits is equal to the sectional area of the shaft or main airway. Also, as the number of splits increase a point is soon reached where the resistance of the shaft or main airway becomes equal to that of the splits; and beyond this point as the number of splits is further increased the shaft or main airway resistance exceeds the split resistance and the ratio of these two resistances becomes practically constant.



RESISTANCE CURVES IN SPLITTING AIR CURRENTS IN MINES

Ques.—How is it possible to divide the air proportionately between two or more splits, in a mine?

Ans.—Two methods are employed: (1) By obstructing the air in those airways that naturally take more than the required amount. (2) By erecting a door at the mouth of the entry or split so as to proportion the area of the intake in each entry to the amount of air required. Each of these methods is shown in Fig. 2. The box regulator shown on the left is usually placed in the return air course, near the end of the split that it controls. The door regulator shown on the right is erected at the point of split, or where the air is divided.

TWO FORMS OF REGULATOR IN USE

Ques.—What determines the extent to which splitting of air currents in a mine may be carried; or, in other words, what determines the limit of splitting the air in mines?

Ans.—Under the conditions that prevail in mines, each time the air is split its velocity is reduced. Since it is necessary that the air sweeping the working face should have a certain velocity in order to dislodge the gases that accumulate in the cavities of the roof and other void places, there is a practical limit to splitting. This limit is determined by the conditions existing at the face, in the mine workings. Ordinarily, the air passing the working face should have a velocity of from 200 to 300 ft. per min.

Ques.—What is meant by the natural division of the air current in a mine, and what necessity arises for a different division of the air between the several districts of the mine?

Ans.—In splitting air currents if the several airways are open and unobstructed, the air will divide between the airways in inverse proportion to their resisting powers. In other words, a larger proportion of air will pass through those airways offering less resistance to its passage. This is called the *natural division* of the air, because no artificial means are used to accomplish the result.

It is generally the case, however, that the longest airways and those that offer the greatest resistance, and, as a consequence, pass the least air, are the ones that require the most. In this case, it is necessary to regulate the division of the air by artificial means, so as to divide the current in the desired proportions and give to each split the quantity of air it needs.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Gardens and Playgrounds in Mining Towns

The average American mining town in its gardenless condition has always seemed a queer anomaly. The few Americans in a colliery village have been drawn from the farming population, and should naturally take readily to garden culture.

The people from England, Scotland and Wales are known for their delight in all kinds of seeding and planting, and the miners who hail from Central Europe are like our own people, mostly farmers in origin, and should naturally till the soil.

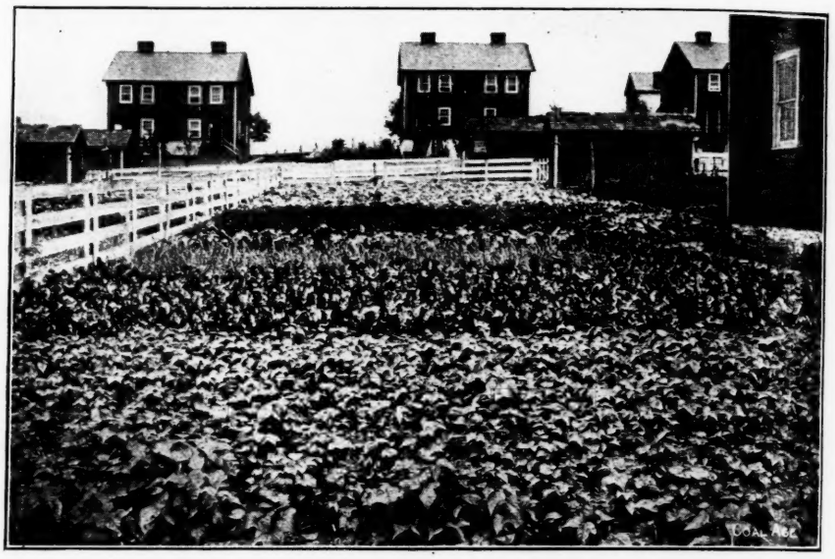
Indeed, the Italian is disposed to form gardens, and he nearly always fences his little lot with an uncomely assortment of boxes, scrubbrush, barrel staves and the like, and plants a little vegetable garden. The many dogs in mining villages root up unprotected gardens, the children trample them down, and unless fences are provided there cannot be any hope of the plants arriving at a healthy maturity.

The Italian fence serves every utilitarian purpose but it is extremely unsightly, and any coal company does well to erect proper fences for its tenants and keep a careful watch over them when the winter sets in, or a tenant purchases a Jersey cow.

It can hardly be expected that the roving tenants of the average village will build fences of any degree of sightliness. The lessee is not sure that he will retain his holding till the fence is rotted away, and then having failed to build a fence, he is obliged to conclude that he cannot have a garden.

The H. C. Frick Coke Co., the United States Coal & Coke Co. and the National Mining Co. are all under one management, and these all have contests each year giving prizes for the best lawns, flowers and truck gardens. It is unnecessary to call attention to the success these companies have had in developing an interest in the beautifying of the surroundings of their tenements. The prize gardens show that their employees enter with ardor into the contest.

The birdseye view of the town of Marguerite, a village of the H. C. Frick Coke Co., near Greensburg, appears on our front cover. It is not necessary to point out its comely appearance. Its general neatness overcomes the harshness of its stiff lines and uniform design.



THIS GARDEN WAS AWARDED FIRST PRIZE AT WYNN, FAIRCHANCE, FAYETTE COUNTY, PENN.

In fact, it is not impossible to have a pretty town on a stiff plan, provided that it is clean and contrasts are provided between the fences and the verdure surrounding them. There is nothing quite so squalid and tawdry as a mining town with a pretense to everything but orderliness. The playground will be noted in the foreground and the concrete ditches along the streets, the rows of protected trees along the sides of the playground and the neat sidewalks which make community life possible.

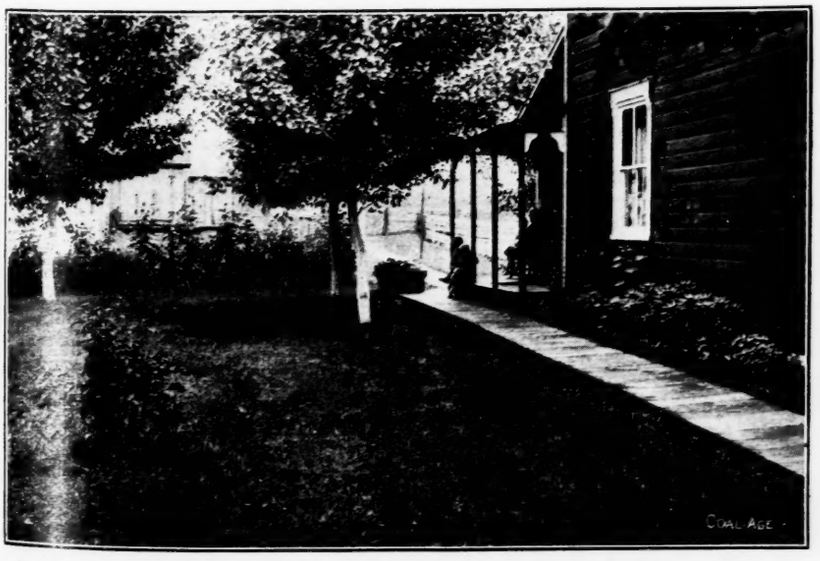
The playground at Phillips is more elaborate than that at Marguerite. The H. C. Frick Coke Co. is making great progress, yet is not advancing recklessly. Systems and devices are tried out at one plant, and if they are successful they are installed in other places. So the practice of the company is not entirely uniform.

The children's playgrounds contain

A GARDEN WHICH DREW FIRST PRIZE AT HECLA NO. 2, TRAUGER, WESTMORELAND COUNTY, PENN.

THIS CAREFULLY KEPT YARD COMMANDED THE FIRST PRIZE AT JUNIATA, NEAR DUNBAR, FAYETTE COUNTY, PENN.

THIS LAWN AND FLOWER BED TOOK FIRST PRIZE AT LEITH, NEAR UNIONTOWN, FAYETTE COUNTY, PENN.



LAWN AND FLOWERS WHICH RECEIVED FIRST PRIZE AT WHITNEY, WESTMORELAND COUNTY, PENN.

swings, sand-boxes, see-saws, sliding-boards and roly-polys, the tendency of which is to make healthy play take the place of mischief. But it must not be overlooked that the H. C. Frick company realizes that not only the children but also the adults need fresh air and recreation.

The company has not only furnished baseball grounds, but has also equipped them with grandstands. It cuts the grass, rolls the infields and marks the foul lines. Last year a Frick league of baseball clubs was started as an experiment. It has been quite successful and it is now organized into several divisions. The pennant winners in each division fight for the championship and a cup is donated yearly by Thomas Lynch, the president of the company.

New Coal Laws in Belgium

FROM A LONDON CORRESPONDENT

Reference is made in the report of the Houillères d' Anderlues, one of the principal collieries in the Charleroi district, to the consequences of the new law which has limited the miner's day to nine hours since the first of the year. The wages per ton, which reached 6.04 fr. ($1.16) in 1909-10, increased to 6.76 fr. ($1.30) in 1910-11, and to 7.17 fr. ($1.38) in 1911-12. Furthermore, a loss of effective work by the men is noticeable. For the year 1910-11 the daily output per man fell from 2035 lb. to 1945 lb. a loss of 90 lb. per man. In addition to this, in some cases the coal extracted is dirtier, in consequence of the fact that the miners are working with less care than previously in order to gain the same wages in a shorter time.

Another result of the new legislation is a reduction of the men's earnings; this varies from 11 fr. ($2.12) to 12 fr. 50c. ($2.41) in two weeks. At the Patience and Beaujonc collieries, in the Liège district, the reduction is stated to have been in 1911, 15.8 per cent., as compared with 1910. The principal result is that a large number of miners are leaving the mines to find employment in other industries not subjected to limitation of the hours of work; this explains the scarcity of workmen from which the coal industry is suffering all over Belgium.

During the first half year of 1912 there was, as compared with the same period of 1911, a reduction of 412,000 long tons in the total output of Belgium. This is 3.7 per cent. of the total output of 11,120,000 long tons. In the year 1911, the decrease in output, as compared with 1910, was 802,000 long tons. It has been calculated that if the new reduction of half an hour in the miner's day (which came into operation January last) has similar results as regards the individual utility of the workmen, the output for the year, 1912, will show a further reduction of from 800,000 to 900,000 long tons, as compared with 1911.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Charles P. Neill, commissioner of labor, has gone on a trip in search of information regarding the best way to start the investigation into the price of anthracite coal. Several trips in search of information on the subject have already been made and it is believed that by September 10, Mr. Neill will have completed his preliminary survey and returned to the city. He will then map out the field of investigation and will set at work some of the investigators of the department who are skilled in carrying on such studies.

They will be expected to go through the whole of the anthracite field and will carry on the inquiry from a statistical standpoint, with the usual detail that is characteristic of the bureau of labor investigations. Mr. Neill now plans to direct the inquiry so as to find out exactly where the increases in the price of coal have been applied, and how much of an added increase has taken place at the several steps in the process of marketing the coal. He is expected to find out whether this was necessitated by the strike in the anthracite regions, or by the demands of the men, and how much of an advance would have been warranted for the purpose of making up the shortage caused by the necessity of additional wage payments.

The desire is to ascertain also whether the strike agreements that have been made in the anthracite field have been at the expense of the consumer, and whether these agreements simply result in unloading upon the public the cost of maintaining peaceful relations in the coal regions.

It is expected that the results of the inquiry will be communicated to the House early next winter and may lead to legislation designed in some way to ease the burden said to be caused by the higher prices now ruling in the coal field.

The inquiry was largely at the instance of some of the Pennsylvania representatives, and the demand for legislation is likely to be pressed in Congress by them. It is expected that there will be a demand for the removal of all tariff duties on coal as a result of the investigation.

Coal Rates in Wyoming

The Chamber of Commerce of Sheridan, Wyo., has filed a complaint with the Interstate Commerce Commission against the rates on coal from the Sheridan District to points in South and North Dakota, Montana, Idaho, Washington and Oregon. It was stated that about three and a half million dollars is invested in the coal mines of Sheridan and that the excessive rates to points in other states discriminate against these mines in favor of other mines in competition with them. The Chicago, Burlington & Quincy R.R. and its connections are named defendants to the complaint.

Mineral Waste in the United States

The Bureau of Mines has issued a report by Charles L. Parsons, chief mineral chemist, relative to mineral wastes in the United States, in the course of which he says:

"The wastes of carbon in our modern economy are almost incomprehensible. In mining coal in this country, probably one-third of the bituminous coal and one-half of the anthracite are left in the mine. Fully 80,000,000 tons of anthracite is now being left behind in the mine each year, and it is estimated that since mining began in this country fully two billion tons of anthracite and three billion tons of bituminous coal have been left in the ground under conditions which make future recovery highly impossible."

Alabama

Pell City—Mineralogist E. W. Hayes has located several fine beds of coal in this vicinity. The deal is backed by Birmingham capitalists who will begin at once to develop the properties as soon as the engineers have decided on the opening of the mines.

The seam of coal covers several thousand acres of land.

California

Vallejo—The United States fuel ship "Jupiter," the first electrically driven seagoing vessel ever built, and the largest ship of any description ever constructed on the Pacific Coast, was launched Aug. 24 at Mare Island Navy Yard. The "Jupiter" will make about 14 knots per hour. She is 572 ft. long and has a 65-ft. beam, with a carrying capacity of 12,500 tons of coal and 275,000 gal. of fuel oil. Coal can be loaded from the "Jupiter" into a warship at the rate of 100 tons per hour, and a duplex pump will permit her to take in or pump out oil to another vessel at the rate of 120,000 gal. per hour.

Colorado

Trinidad—Two men were killed by an explosion of a pocket of gas at the Rocky Mountain Fuel Co.'s mine, at Piedmont, on Aug. 30. The gas was fired by candles which they carried.

They were making an examination of the workings after most of the force of the miners had quit work.

Illinois

Belleville—The Randall coal mine is expected to be reopened by the Mulberry Coal Co., and will employ 200 men.

Carlinville—Coal has been discovered in paying quantities on the M. J. Anderson farm in Spanish Needle, six miles south of this city, at a depth of 350 ft. The drill is being removed to the Morrison farm in Hilliard Township, where a test will be made on the holdings of A. W. Crawford.

Mr. Crawford has a total of 50,000 acres under option, all contiguous, and, if the good showing continues, it will not be long before a coal field will be opened between this city and Gillepsie.

Herrin—Madison Coal Co., of which A. J. Moore is president, has purchased the Robert Dick coal property, four miles west of here, adding 320 acres to the company's 2500 acres holding in this field. Options of the Cartersville and Big Muddies properties of 1000 acres are expected to be taken up by the same company in a few days.

Hillsboro—The Shoal Creek Coal Co., which operates the mine at Panama, is preparing for a big boom in that village. The company has begun the work of building 50 additional houses and expects to finish them at the rate of at least one a day. A number of mechanics are engaged in the work.

Nakomis—A. J. Mason, of St. Paul, has announced that he and F. B. Lynch, together with J. E. Rutledge, of St. Louis, have bought the land near here containing 25,000,000 tons of coal.

A shaft has been sunk more than 600 ft. and coal will be mined within a few months. The Chicago & Eastern Illinois R.R. is constructing a line from Springfield and Peoria through the mine. This will permit an all-rail coal line to compete in the Northwest with the lake and rail coal line at the head of the lakes.

Paris—From present appearances, de-

velopment work in the Edgar County coal fields is about to begin. A force of men, who will operate the drilling machine, arrived in Nevins, Aug. 20, and the outfit was expected to arrive the next day.

The machine is set up on the Morton farm. Tests made in the past have proved the existence of a large body of fine coal at a depth of several hundred feet.

Indiana

Brazil—The Miami Coal Co. has made a great and valuable find at Mine No. 5, located near Ehrmandale. The discovery is a bed of the best block coal, ranging in thickness from 3 ft. 10 in. to 5 ft. The roof is said to be excellent, so that the company can profitably mine coal. The bed is an extension of the principal Brazil block seam which runs out at the surface east of Harmony.

The Zellar McClelland Coal Co., which has been drilling for coal on the Campbell farm west of the city, has discovered a fine bed of block coal 3½ ft. thick. A shaft will be sunk at once, and it is the intention of the company to have the mine in operation by winter. Since the new shaft will be sunk close to the city, it will be known as the "town mine." Probably wagons will be used to deliver the coal this winter, as it is believed that a switch cannot be laid this year. More drill holes are being put down on adjoining farms as it is believed that the supply of coal is practically unlimited.

Hymera—Prospects of obtaining a speedy settlement of the strike conditions in the mining camps at Hymera and Shelburn, where more than 800 miners have been idle for more than a week, are considered bright by both the operators and the official of the Mine Workers' organization.

The miners have resumed work pending a settlement, while the matter is to be threshed out by the officials of both organizations.

The trouble was started when the operators demanded that the drivers discontinue the use of carbide lamps on the ground that they are dangerous, being easily extinguished. Though, in a measure trifling, it has been a hard difference to settle.

Linton—Two beds of fine workable coal, below No. 4 seam of coal, worked for the past 35 years, were found in the Linton field in Greene Count, Aug. 17. These two seams are from 5 to 7 ft. thick, and from 9 to 11 ft. respectively.

The first seam of the new No. 4 is 60 ft. below No. 4 and is said to be of fine quality. Two companies are now operating in this field and promise to be hoisting No. 3 coal in less than a year. The field of No. 3 is more extended than that of No. 4 and is deeper. The discovery of the new seams means much to the vicinity.

Princeton—The Princeton miners, who have been out of employment for several weeks as the result of a difference of opinion over whether the company or the men should take out the coal left by the machines, have resumed work, Aug. 26, an agreement having been reached. Under the arrangement the company will have the bottom coal removed.

Kentucky

Earlington—W. R. Brashear has been appointed assistant state mine inspector for the western district of Kentucky to succeed T. O. Long. Mr. Brashear's appointment is for four years and was made by Gov. McCreary. His salary will be $1800, the new assistant getting the benefit of the raise provided for by the last General Assembly. Mr. Long made an attempt to gain from the new provision, but his claim was rejected by the attorney-general. Mr. Brashear's appointment is effective immediately.

Harlan—The Harlan Coal Mining Co., which recently took over several thousand acres of coal lands in Harlan County, has established no less than six mining operations at various points in that county, the plants being among the largest in the new field. The property is a part of the former holdings of T. J. Asher, lying along the new Wasito & Block Mountain R.R.

Jenkins—The Consolidation Coal Co. has begun the shipment of coal to the Detroit, Chicago and Great Lakes markets from mines Nos. 1, 2, 4 and 5, and will shortly begin shipping from Nos. 3, 6 and 7 mines. According to the present outlook, regular freight and passenger service will be established over the Sandy Valley & Elkhorn R.R., entering Jenkins, shortly after Sept. 1. It is expected that coal mining will be started at McRoberts, the Consolidation's new city on Wright's Fork, about Oct. 1

Lexington—Two branch roads will probably be built by the Chesapeake & Ohio during the coming year, adding 25 to 50 miles to the mileage. All the coal produced in the Elkhorn and Big Sandy valleys passes through Ohio to the lakes and the West, and this amount is steadily increasing.

Louisville—Col. S. K. Ford, wealthy owner of Kentucky coal lands, and B. L. Hall, of this city, today announced the sale of about 1,000,000 acres of coal and timber land in Kentucky to a syndicate of English and Dutch capitalists for $5,000,000.

Dutch and English capitalists are reported to have purchased 1,000,000 acres of coal lands in Breathitt, Knott, Perry, Harlan, Clay, Letcher and Leslie counties, Ky., according to a recent announcement. The price is said to have been $5 an acre.

Pine Hill—The Kentucky Portland Cement Coal Co. is progressing rapidly with the development of its coal holdings. Two mine entries have been driven, while foundations have been placed for the electrical machinery, which is now being received and installed. Railroad accomodations have been provided by the Louisville & Nashville R.R. The Kentucky Portland Cement Coal Co. was incorporated in April with a capitalization of $2,400,000. The mines will have a daily output of 500 tons. J. W. Dreisbach, general superintendent of construction, is directing the work.

Sturgis—The West Kentucky Coal Co. has begun work on the construction of 40 new barges which will be utilized in providing an outlet for the coal mined at the company's plant at Sturgis. The 40 barges supplement an order for ten, which were begun some time ago. The barges will be built at the plant of the West Kentucky Coal Co. at Mechanicsburg, on the Tennessee River. The cost of the vessels will be about $125,000, a quarter of a million feet of lumber having been contracted for. From eight to ten of the barges will be turned out each month. C. F. Richardson, vice-president and general manager of the company, will superintend the work, having closed the contracts personally.

Ohio

Caldwell—Initial steps have been taken by the Belle Valley Coal Mining Co. toward locating a new coal mine near the Abel Whealdon homestead.

Columbus—John C. Davies, Ohio state mine inspector, has been holding a school of instruction for his district deputies during the past week. This is their first meeting with the new inspector and Mr. Davies took advantage of the opportunity of getting acquainted with his men. Mr. Davies announces there will be no change in the person of affairs as appointed by his predecessor, George Harrison.

East Liverpool—Stockholders of the new Elk Run Coal Co., who recently obtained an Ohio charter, have just organized.

The company has just purchased the coal under 1000 acres in Columbiana County, and will develop these holdings from a working mine, which has also been taken over. It is planned to work over 200 miners by Oct. 1. A shaft mine is worked.

Gloucester—The work of opening a new mine by the Hisylvania Coal Co., of Columbus, is progressing satisfactorily. The entry has been driven 220 ft. and there is still 280 ft. to go. It is a slope of 16 ft. wide and taps a seam 9 ft thick. It is expected to have the mine in operation about the first of the year.

Steubenville—Three miners have been

killed recently in the mines of this vicinity. Two of them lost their lives by fall of slate, and the third was killed by the fall of an iron bar.

Wellston—The C. K. Davis Coal Co.'s lands, formerly the old Lincoln Furnace lands, were sold Aug. 17 to A. G. Thorne, of New York City, representing a syndicate composed of C. K. Davis and his New York associates. It is not known just now what they expect to do with the lands.

Oklahoma

Heavener—The Choctaw-Cherokee Coal & Mining Co. has started the survey for a short railroad line connecting its mine with the Kansas City. The company expects to have 100 miners working in the shafts. There also is good prospects that the mines of the Degnan McConnell Coal & Mining Co. north of the Heavener, will be opened within the next few months.

Pennsylvania

ANTHRACITE

Brocton—Plans are being made to increase the capacity of the Schuylkill Lehigh Coal Co. plant here to 1000 tons a day, about treble its present output. Attorney John T. Lenahan, of Wilkes-Barre, president.

Hazelton—Through accident, a coal bed was discovered in the Catawissa Valley and now a breaker is being erected there.

The strike of the hoisting engineers at the collieries of G. B. Merkle & Co., due to readjustment of wages, was settled Aug. 29. The 4000 miners, who have been idle as a result of the strike, returned to work Aug. 30.

Pottsville—Two miners were killed and one seriously injured, probably fatally, by the premature explosion of a blast in the Lincoln colliery of the Philadelphia & Reading Coal & Iron Co., Aug. 23.

They had ignited a fuse in a drill hole and were standing by the charge when it went off.

The excuse given by the coal dealers in Eastern cities for raising the price of coal, that they fear famine, is absolutely without foundation, according to anthracite wholesalers of this city. They claim that they have no market for their coal at present.

Scranton—Five hundred employees of the Mt. Pleasant colliery, of the Scranton Coal Co., went on strike, Aug. 25. Several of the miners charged that the new agreement was not being adhered to, and they prevailed upon every worker to quit work.

Shamokin—Drivers and loaders employed in the Colbert colliery of the Shipman Coal Co., have struck for an increase of wages, tying up the plant.

Wilkes-Barre—Union officials of the colliery of the Lehigh Coal Co., have served notice that, unless a nonunion man was dismissed, the miners and laborers would strike.

The operators are expected to refuse to discharge the man and claim a strike would be in direct violation of the ninth award of the anthracite coal-strike commission. Five hundred men are employed at the plant.

BITUMINOUS

Bens Creek—Shoemaker Coal Co. this morning opened the mine recently purchased from the Webster company and known here as No. 2.

Boswell—The Merchants' Coal Co. expects to construct 25 large modern houses, valued at about $23,400.

All the houses are being built on modern lines, and the rooms are of convenient size, light and airy.

The company has also erected a fine pavilion at Barswell Park.

Charleroi—Five hundred coke ovens are being started by the Reliance Coal Co., and two new coal shafts are being sunk on the Washington County side of old lock No. 5. On the opposite side of the river, in Fayette County, 200 additional ovens are being built.

Charleroi—A strike of 350 men at the Apollo mine, near Fayette City, arising from the discharge of a fellow worker, has been settled after a week's duration.

Openings for the new mines of the Indian Creek Coal & Coke Co., indicate a 7-ft. bed of coal at White Bridge, where two openings are to be made, and a 5½-ft. bed at Hutchinson, opposite Indian Creek reservoir. The mines, which are owned by Zimmerman and Mellon interests, are expected to be in operation soon.

The coal is of the Freeport grade and the holdings of the company aggregate 17,000 acres. For steam purposes the coal is superior, it is said, to Pittsburgh or Somerset. It has been used in the engines of the Indian Creek Valley R.R., with considerable success.

Ebensburg—An extension of the options on coal lands, secured for the Ebensburg Coal Co., some time ago, has been granted, and it is reasonable certain that options on the tracts of 4000 acres will be listed before their expiration, involving a sum of $300,000.

The tract adjoins the immense holdings of the Ebensburg Coal Co., at Colver, now in process of development, extending in a northerly direction toward Bakerton and easterly toward Bradley Junction. The price to be paid is $75 per acre.

Johnstown—Indications of another development in the Shade Township section of the Somerset coal field are found in the purchase of the Umberger estate by the Loyalhanna Coal Co., for $20,191. The tract contains between 4000 and 5000 acres.

While the exact plans of the Loyalhanna Coal Co., concerning its new acquisition have not been made public, it is understood that the operations will be extended to the Umberger lands where the openings will be made. The tracts is valuable because the coal under it is of the smokeless variety, which is in such demand at Eastern markets.

Leechburg—L. S. Roberts sold for J. L. Mitchell, of Chicago, 1000 acres of coal land in Gilpin Township, to the Maher Coal & Coke Co. This will give employment to a large number of men. Plans are on foot to increase the output of the mine, by using electrical power.

Pittsburgh—A settlement of differences between the coal miners and operators of the Pittsburgh district, which have existed during the past week, was reached Aug. 29 at a conference between the scale committee of the miners and the committee representing the operators. A uniform 8-hour day is to be established throughout the district.

Somerset—A Philadelphia concern is expected to become owner of 3000 acres of land along the Baltimore & Ohio R.R., within a few days. It is expected that they will begin development soon. The price paid is said to be $100 per acre.

Tennessee

Chattanooga—Rich coal beds have been discovered on Emory River, near Oakdale Junction, 84 miles north of Chattanooga, and is similar to the coal mined for several years at Rockwood and Emory Gap. The seam is to be opened on an extensive scale.

West Virginia

Bachman—It is rumored that the old coal mine near Hawks Nest, will be opened soon by the River Valley Colliery Co. Mrs. D. W. Boone, of Lookout, is the general manager.

Wheeling—New coal works at Edington Lane will be ready to start operations in the very near future. The mine is located opposite the Storch mine, which is in operation.

Alaska

Seward—A dispatch says that the officers of the cruiser "Maryland," who went to Alaska a few weeks ago to examine the coal fields there, have found great quantities of excellent coal.

Germany

Gelsenkirchen—Five coal miners were killed and another dangerously injured by falling down one of the shafts here, on Aug. 30. The accident was caused by the collapse of a wooden platform.

Construction News

Honaker, W. Va.—The Flat Rock Coal Co. has been organized for the purpose of developing and putting on the market the celebrated Lewis Creek domestic coal.

The company has a 30 year lease on 500 acres of land and a charter for mining, buying and shipping coal has been granted them. The maximum capital is placed at $50,000.

Zanesville, O.—A new coal company is to operate in the southern part of Muskingum county, according to an incorporation at Columbus, Aug. 20, known as the Muskingum River Coal Co., capitalized at $25,000.

Wilkes-Barre, Penn.—The Maderia-Hill Coal Co., of Philadelphia, will start the erection of a large modern breaker to cost in the neighborhood of $100,000.

Two slopes are now in the course of construction and work on the new breaker will start in a few weeks. The operation will employ about 500 men and boys. It will be called the Maderia.

Charleston, S. C.—Plans have been made for the erection of an extensive coal handling plant at Charleston, where every facility will be provided for rapid coaling of vessels. Arrangements have been made with the Southern Ry., over which company's rails the field reaches tidewater, for a rate of $1.40 per gross ton on coal from the Clinchfield mine, destined for coastwise and export traffic.

Lexington, Ky.—The Mineral Development Co. is preparing for extensive developments in its large holdings on Younts Port or Boon Creek, in Letcher County. Recently a deal has been on between the Mineral Co. and the Consolidation Coal Co., which is building the cities of Jenkins and McRoberts.

This deal gives the Mineral Co. a solid block of 15,000 acres of coal land, while the Consolidation Co. now owns a solid block of 18,000 acres.

It is announced by officials of the Mineral Co. that actual work on the developments of its Younts Fork holdings will be started at once. A three mile branch line from the main line of the Lexington & Eastern will be rushed to completion. At least $1,000,000 will expended.

Indianapolis, Ind.—The Alberta Mining Co. has been incorporated with a capital stock of $50,000. The object of this corporation is to carry on the business of coal mining.

Marquette, Mich.—Preparations for opening the Cascade Mining company's property, at Palmer were started last week. Clark Kirpatrick, Oscar B. Warren, Captain Thomax Nichols, the superintendent, and others interested in the property selected the site for the shaft.

Philadelphia, Penn.—Rapid progress is being made with the tunnel in process of construction between the new million dollar coal breaker at Hauto and the 800 ft. shaft on the top of Nesquehining Mts.

Lectonia, O.—Steps have been taken at New Waterford toward raising funds for the purpose of sinking the first shaft in the development of a prospective coal mine on 800 acres of land along Bull Creek.

Ashland, Ky.—The Crystal Block Colliers Co. is the style of a new concern which has been formed at Ashland, Ky., and which has taken over 22,000 acres of coal lands near Peach Orchard, Ky. Interested in the new company are J. W. M. Stewart, an attorney of Ashland, and Dr. M. G. Watson, of Huntington, W. Va.

Chronology of Coal Mining for August

Aug. 1—Western Maryland extension to Connellsville, Penn., put in operation.

Aug. 7—Girard colliery at Ravens Run, Penn., destroyed by fire. Loss, $175,000.

Aug. 8—Explosion of firedamp at Lorraine shaft, Gerthe, Westphalia, Germany, killed 109 men, and injured 23.

Aug. 9—Fifteen hundred more miners went on strike in the Kanawha field, West Virginia.

Aug. 12—Western Allegheny R.R. Co. placed in hands of a receiver.

Aug. 13—Explosion at Abernant mine, Alabama, killed 17 colored miners.

Aug. 17—First aid demonstration at Greensburg, Penn.

Aug. 21—Conference of mine workers and operators of Pittsburgh settled strike at Manown colliery.

Trade Publications

WATER LIFTED BY COMPRESSED AIR. 70 pp.; 6x9 in.; form 75, issued by the Ingersoll-Rand Co., 11 Broadway, New York City.

During recent years much progress has been made in the art of pumping water by compressed air. The air lift has proved especially useful for city and town water works, asylums, hospitals, plantations, railway water tanks, irrigation, private country homes, pumping mines, ice manufactories, breweries, cold storage and packing houses, textile mills, dye works, bleacheries, sewerage installations, dry-docks, seaside water works, stock farms, etc., in fact anywhere and everywhere that clear and abundant water is needed. In this catalog the Ingersoll-Rand Co. explain very thoroughly the different methods employed and give figures showing the actual cost of various installations.

The air lift involves the use of an air compressor, located where the expense of attendance is least; an air receiver adjacent to this compressor; a pipe line conveying the air from the receiver to the wells; one or more wells drilled to a depth proportionate to the height of the lift and the depth of the water strata below the surface; air and water pipes running down inside these wells, the proper proportion of their vertical length being submerged when at work, representing the pumping apparatus proper.

Catalog is profusely illustrated to show the workings of the different systems.

Personal

Edward Soppitt, general superintendent of the Jamison Coal & Coke Co.'s mine in the Greensburg field, has tendered his resignation, to take effect Sept. 1. Mr. Soppitt has accepted the general superintendency of the Latrobe-Connellsville Coke Co.'s big holding in the Latrobe field.

Industrial News

J. C. Tarvin and J. S. Webster are members of a new firm which has been formed in Middleboro, Ky., to handle mining equipment of all descriptions. Mr. Tarvin formerly was with the C. M. McClung Company, while Mr. Webster until recently was connected with the Virginia-Tennessee Hardware Company, of Bristol. The firm has opened offices in the Motch-Moomau building in Middlesboro, and will shortly establish a branch in Knoxville, Tenn., according to present plans. Both are well known to operators in Kentucky and Tennessee, having become acquainted in their former roles of traveling salesmen.

The Consolidation Coal Co. has been awarded a contract involving the delivery of crushed coke to the city of Louisville for the next year at a delivered price of eight cents a bushel. The aggregate cost of the coke will be about $3000.

On Saturday, August 31, all the superintendents, together with the heads of the various departments of the Consolidation Coal Co., Fairmont, W. Va., upon invitation, made an inspection visit at the Fairmont Mining Machinery Co. Half the day was spent in going through the plant and warehouses. Afterwards a sumptuous repast was served and the party was taken to a ball game.

Publications Received

ABRIDGED TEXTBOOK ON FIRST AID. By Major Charles Lynch, U. S. A. Prepared for and indorsed by the American Red Cross. General edition. 183 pp., 4x6 in., 55 ill. P. Blakiston's Sons & Co., Philadelphia.

GENEALOGICAL TREE. Showing the more important compounds existing in, and derived from, coal tar by distillation, together with those formed by further chemical treatment. Compliments of C. A. Wood Preserver Co., St. Louis, Mo.

OUTLINE OF THE SMOKE INVESTIGATION. University of Pitsburgh, Department of Industrial Research. Bulletin No. 1, August, 1912. 16 pp., 6x9 in., no ill.

GRADUATE WORK IN ENGINEERING. University of Illinois. Bulletin No. 84. 12 pp. 6x9 in. Published by the University.

JOURNAL OF THE WESTERN SOCIETY OF ENGINEERS. Published monthly, excepting July and August, by the Society. 6x9 in. 90 pp. Subscription price, $3 per annum.

THE EFFECT OF COLD WEATHER UPON TRAIN RESISTANCE AND TONNAGE RATING. By E. C. Schmidt and F. W. Marquis. University of Illinois Bulletin No. 69; 6x9 in. 25 pp., with charts. Published by the University. 20c.

Recent Coal and Coke Patents

18,261 of 1911. J. Walker, 1, Launcher Head, Lochgelly, N. B. Improvements in and relating to Gearing or Appliances for Preventing Overwinding in Colliery Engines and the like.

26,517 of 1911. F. S. Tuckett, 120, East Ferry Road, Millwall, London, E. An Improved Method of Forming Shafts for Mines and the like.

28,785 of 1911. G. Inglis & Co., Ltd., and G. Inglis, of Albert Engineering & Boiler Works, Airdrie, N. B. Improvements in and relating to Engine Speed Controlling Gear for Preventing Overwinding in Collieries and the like.

5171 of 1912. H. Hirst, Crescent House, Moorlands Avenue, Dewsbury, York. Improvements in Means for Preventing Overwinding and Overspeed in Mine Shafts and the like.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

All branches of the coal trade showed continued improvement during the week. Supplies are short almost without exception in all grades, and in every part of the country. This is particularly the case in hard coal, but it is becoming more noticeable in bituminous as well.

Eastern anthracite dealers are becoming more concerned over the situation and say that the outlook is serious. While every effort is being made to meet the constantly increasing demand, it appears that there is likely to be a distressing shortage in the large cities. Mining is being pushed to the limit, and shipments carefully proportioned to the different centers. Premiums are being freely offered, and inquiries for October and November deliveries are being met with the reply that no forecast can be made as to the situation then.

The bituminous distributors in the East are becoming cautious about future business, and the old prices are being gradually withdrawn. Deliveries are slow and consumers are inclined to take anything they can get; there is an upward trend in both prices and demand, and indications are good for a busy winter. The labor troubles in the Paint Creek field have added another disturbing factor to the situation.

In general, all grades are in active demand and orders are being entered free of any restriction as to kind of equipment. The requisitions on contract are heavier, and the effects of the car shortage are becoming more pronounced. In the Pittsburgh district the manufacturing demand has improved slightly, while the Lake shipments have shown a decided increase and are expected to be quite heavy during the next two months or more; production is now practically equal to any previous record and would be still larger were labor and transportation facilities better.

In Ohio prices are ruling firm at the new circular established Sept. 1. Domestic is strong, manufacturing more active, and the steam demand better, while the car shortage is becoming more general throughout the state. The congestion at the head of the Lakes is being relieved, and the movement to the Northwest better.

In the Western markets there is a noticeable improvement. Hocking shippers are behind on orders due to the car shortage in Ohio, and the steam demand is improving rapidly.

Boston, Mass.

Firmer prices are the rule this week in bituminous. Distributors of Pocahontas and New River for inland points are cautious about future business and old prices are being withdrawn on the better grades from Pennsylvania. There is marked improvement all along the line. The Georges Creek shippers are beginning to be slow on deliveries and forehanded consumers are taking supplies as fast as they can be sent forward. The feeling is general that transportation is likely to be congested during the winter and the outlook for prices is certainly encouraging. A further shortage is reported at the Hampton Roads terminals, due to foreign steamer arrivals. The $2.70 price is being firmly held. The active bidding for the few large vessels that are available shows the extent to which some of the buyers are worried over getting supplies forward in season. The indications are that we shall soon have a good spot market.

A report that the labor troubles in the Paint Creek district had spread into the Loup Creek section of the New River field signified another possibly disturbing factor in the situation. The all-rail trade shares the hardening in prices. All the coals are netting more for current sales and orders are now being entered free of any restriction as to kinds and sizes of cars. Vessel freights are firm at 90c.@ $1 from Hampton Roads to Boston. Schooners have been making quicker trips of late, but there is still a shortage of tonnage.

Anthracite here is in a serious state. Dealers everywhere are much concerned over the prospects. Many have visited New York and Philadelphia and they come back more alarmed than ever. They begin to realize that there is not enough stove coal, for instance, to go around, and the effort is already being made to get the public to accept other sizes in place of it. It is more than likely the large cities especially will see distressing times when cold weather sets in.

Wholesale quotations are as follows:

Clearfields, f.o.b. mine	$1.10 @ 1.35
Clearfields, f.o.b Philadelphia	2.35 @ 2.60
Cambria County, South Fork, etc., f.o.b. mine	1.25 @ 1.55
Somersets, f.o.b. mine	1.30 @ 1.50
Somersets, f.o.b. Philadelphia	2.55 @ 2.75
Pocahontas, New River, f.o.b. Hampton Roads	2.70 @ 2.80
Pocahontas, New River, on cars, Boston	3.85 @ 3.95
Pocahontas, New River, on cars Providence	3.70 @ 3.85
Anthracite stove, f.o.b. New York	5.30 @ 6.00
Anthracite egg, f.o.b. New York	5.20 @ 5.75

New York

Anthracite—All the summer discounts have finally been eliminated and nominal anthracite quotations are now up to the full winter schedule. In spite of this, however, there is no reduction in the acute demand, which is still as urgent as during the last two months.

While the past month has been replete with numerous petty strikes and other troubles which have tended to interfere with work at the mines, it is believed among the large companies that August will establish a new record for the hard-coal region. The movement is now quite heavy and this is being reflected by a noticeable increase in the arrivals at this point. However, these are not of sufficient magnitude to give promise of any relief and the larger companies are still prophesying an acute shortage during the coming winter.

Prevailing prices at New York are about as follows:

	Upper Ports	Lower Ports
Broken	$5.00	$4.50 @ 4.90
Egg	5.25	5.20 @ 5.60
Stove	5.25	5.20 @ 5.60
Nut	5.50	5.20 @ 5.35
Pea	3.50	3.30 @ 3.45
Buckwheat	2.75	2.15 @ 2.55
Rice	2.25	1.75 @ 1.95
Barley	1.75	1.60 @ 1.70

Bituminous—There is a gradual but quite perceptible hardening in the soft-coal market. This improvement has been quite marked at the other large distributing centers in the East, but New York, as usual, is rather slow in responding to the more active demand.

Prices have hardened up appreciably during the week, all along the line, and advanced on some grades. The movement on contracts is quite heavy and spot coal can be obtained only at a premium.

The visible supplies on hand are rather low for this period of the year, although about the same as during the past two or three weeks. The car shortage is becoming more pronounced and the heavy floods in Pennsylvania during the early part of the week have seriously interfered with the production there.

Quotations have undergone a slight advance during the week and are now quite firm as follows:

West Virginia, steam	$2.10@2.50
Ordinary grades Pennsylvania	2.50
Fair grades, Pennsylvania	2.50@2.70
Good grades, Pennsylvania	2.75@2.80
Best Miller, Pennsylvania	2.85@3.00
Georges Creek	3.25

Pittsburgh, Penn.

Bituminous—Last week the miners and operators of the Pittsburgh district reached a final settlement of the differences which have existed since the signing of the two-year scale at the close of last March, and no further contentions are expected to arise. The movement of coal is somewhat heavier, manufacturing demand having slightly improved, while shipments in the Lake trade have increased, and are expected to be very heavy for two months or more. Production in the district is practically up to the record rate and would probably be somewhat larger were the labor and car supply better, although relatively little difficulty is being experienced in these respects, except at certain mines.

Prices are slightly stiffer, and we quote mine-run and nut 5c. higher and slack 10c. higher, the new quotations representing practically the market on ordinary lots for immediate shipment: Mine-run and nut, $1.05@1.10; ¾-in., $1.25; 1¼-in., $1.35; slack, 60@70c. per ton at mine, Pittsburgh district.

Connellsville Coke—The market has been quieter in the past week, but with sufficient demand to absorb all coke produced and maintain prices. Sales of perhaps 10,000 tons or more of prompt furnace coke have been made, at $2.25, but there has been little, if any, contract coke put through since that noted in past two reports and which fixed the contract market at $2.25. Some sellers are asking $2.35, but conditions do not seem to be ripe for an advance yet, there being less demand than expected from additional blast furnaces blowing in. We quote: Prompt furnace, $2.25@2.30; contract furnace, $2.25@2.35; prompt foundry, $2.40@2.50; contract foundry, $2.40@2.75. This week's production is curtailed on account of Labor Day, but furnaces have secured extra shipments in advance in most cases.

The *Courier* reports production in the Connellsville and lower Connellsville region, in the week ending Aug. 17, at 374,101 tons, a decrease of 12,000 tons, and shipments at 3951 cars to Pittsburgh, 6268 cars to points west and 890 cars to points east, a total of 11,109 cars, a decrease of 142 cars.

Philadelphia, Penn.

Every effort is being made by the anthracite companies to meet the constantly increasing demand for this grade. Mining is being rushed to the utmost and the distribution of the output is carefully scrutinized, in order that every territory covered shall receive its proportion. The sales departments of the various companies do not hesitate to say that there is not likely to be any let up in the demand, and that, with the coming of the cool weather, and the return of many householders to their homes, the situation is likely to become more acute. The whole country seems to be feeling the effects of this shortage. No one is satisfied.

Inquiries for coal to be shipped during the months of October or November, are met with the reply that no forecasts can be made as to the conditions existing at that time. There is no talk of cutting of prices and premiums are the rule rather than the exception. Ship the coal at any price, is the way many orders are being received. All the talk about the automatic increase of 10c. per ton, while helping fill up the newspapers, does not increase the output.

There seems to be an upward trend not only in the price of bituminous coal, but also in the demand, and surface indications point, at the present time, to quite a busy winter. Every week sees an improvement in this branch of the trade.

Baltimore, Md.

The improvement in the Baltimore coal market continued through the week, with the demand even more brisk than the previous week, and prices slightly firmer. The warning sounded by several of the larger companies has had its effect, and many consumers purchased the product freely. Others who placed contracts some time back, took the advice of the coal men, and authorized the companies to increase deliveries. The trade is still advising that coal be purchased now, as when the car shortage becomes more pronounced, prompt delivery will be almost impossible.

The effects of the limited supply of equipment were felt through the week, and it was reported that two or three of the mines in West Virginia had reduced their force, the operators stating that there was no use in mining when the prospect of getting cars was so poor. Officials of the B. & O. are taking every precaution to prevent a serious shortage of equipment on their system.

With the exception of the low-grade coals, prices are about the same as quoted the week previous. Operators say that inferior grades are selling 5c. higher than the price heretofore quoted.

Winter prices for anthracite coal have gone into effect, which means an increase of about 25c. per ton higher than those in effect last winter. The coke market is getting a bit more active, and prices are improving.

Buffalo, N. Y.

The bituminous trade is growing stronger right along, and there is report of advances in prices here and there. At any rate there is no more cutting of prices, and it is quite possible that quotations will have to be raised before long, as dealers are now reporting that consumers at various points are getting frightened.

The demand is general and the car shortage is gradually becoming the same. There are reports of embargoes every week at one point or another, and the prospect is that there will be many more of them soon. This alone would stiffen bituminous prices, aside from the steady increase in consumption. Dealers who have contracts report that every pound is taken promptly and the consumers could use much more than they are entitled to. The situation at long distances from the mines, as in northern Canada, is becoming serious.

Bituminous quotations remain very firm at $2.57½ for Pittsburgh three-quarter, $2.47½ for mine-run and $2 for slack, with Alleghany Valley about 25c. less. The coke trade is even stronger and more active than coal, scarcity of men being a big factor in the situation. Quotations are on the basis of $4.50 for best Connellsville foundry.

Anthracite shipments from Buffalo by Lake for August were 713,548 tons, as against 573,466 tons in August last season. For the present season to date, the shipments were 1,782,933 tons, as against 2,481,289 tons to date last season. This monthly gain of 240,000 tons will all be needed. In fact shippers state that they are apparently getting farther behind on their orders all the time. The demand includes all sizes, with stove apparently scarcest, and it comes from all directions about equally.

Columbus, Ohio

Activity characterized the coal trade in central Ohio during the past week. The domestic demand is improving as the winter approaches and every other branch of the business is showing a good movement. On the whole the tone is good and the prospects for the future are considered bright. Prices are firm and were advanced by new circulars, effective after Sept. 1.

Car shortage is growing worse in every mining section of the state, which, coupled with the better demand for domestic sizes is the main cause for the advance in quotations. In eastern Ohio, the car shortage was bad and only about 50 to 60 per cent. of the normal output was mined during the week. In the Hocking Valley, there was considerable inconvenience as a result of car shortage, and the same was true of the Pomeroy Bend district.

The domestic trade has been good in every respect and there is considerable stocking in the better grades, such as Pocahontas and splints. The steam business is holding up well, and, in fact, shows quite an improvement over the previous week. Manufacturing generally is more active, especially in iron and steel industries.

The Lake trade is more active, as congestion on the upper docks is being relieved to a certain extent. As a result

shipments via the Lakes to the Northwest are more active and will probably continue strong right up to the close of navigation. Chartering of boats is still going on, and all Ohio fields are participating in the active Lake trade.

Production in the Ohio fields has been interfered with to a certain extent by the growing car shortage and some little labor troubles. In eastern Ohio the output was about 60 per cent. of normal, while the Hocking Valley produced about 70 per cent. Other fields were affected by the shortage of cars.

Quotations in the Ohio fields are:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.65		$1.65	$1.65
3-in.	1.45	$1.15	1.50	1.45
Nut	1.15		1.50	
Mine-run	1.20	1.00	1.25	1.20
Nut, pea and slack	0.60		0.60	0.50
Coarse slack	0.50	0.65	0.50	0.40

Hampton Roads, Va.

There has been a slight change during the past week in the situation at Hampton Roads. While there is not quite so much coal dumped for New England ports, several steamers have put in for full cargoes for Mediterranean and South American ports. The fact that the dumping for New England piers has been light is no indication of a falling off in that end of the business, as a number of schooners due to load during this week were delayed and will not be included in the August loading.

Little free coal is at the present time on the market at this port. Even though there has not been a general advance on the tidewater coals, this may be expected very soon. The dumping figures for the month of August are not yet available, but up to the present time each of the three piers have passed the previous month's record, and it may be safely assumed that a million tons will go over the three piers this month.

A large number of battleships have been in Hampton Roads during the past week and the navy barges have been kept busy supplying them with coal. This is business that is not generally counted upon, and puts additional life into the local situation.

Discouraging to shippers and consumers alike, vessel rates still remain strong. Shippers are also experiencing some trouble at the mines on account of the poor car supply. The car shortage has appeared much earlier this year than it does customarily, but it is hoped it will be of short duration.

Louisville, Ky.

Coal men of Louisville and Kentucky are much alarmed at the prospects for a serious car shortage in the near future; in fact, it is being felt already. It promises to affect the Louisville & Nashville, the Illinois Central and the Southern railways. Eastern Kentucky, Tennessee and western Kentucky will be affected.

Much double tracking is being done by the railroads in this section, made necessary by the opening up of so many new mining fields. In the Elkhorn district and Harlan fields this is especially true. The business there is expanding to such an extent that a large supply of equipment is needed by the railroads.

Coal men are looking forward with some alarm to the congestion which is apt to occur if the car shortage becomes any more serious. This condition is almost certain to have an effect on prices. The railroads are expected to put forward every possible effort to avoid a shortage, as it will prove a serious loss to them as well as to shippers.

The local retail trade is remarkably good and prices are higher than at this time last year. The market for steam coal is weak at this time, but the demand for domestic, and other purposes, is active. There is a scarcity of labor in the mining regions, especially in eastern Kentucky. New and important contracts are being made in Louisville and elsewhere by mining interests in the Harlan district. The tonnage of this field is constantly increasing and a fine future seems to be in store for it.

Detroit, Mich.

At this early date there is a deplorable shortage in the local coal market, and if there is another freight congestion of the magnitude of the one last winter, the situation will be very serious. The large coal dealers of the city are rushed now, taking care of the orders on their books, and some of them declare that it is utterly impossible to take on any new business.

The dealers are unanimous in their belief that Detroit faces a coal famine of larger proportions than was first predicted. The large shippers are urging the consumers of steam coal to lay in as much fuel as their storage capacity will permit.

Some of the larger consumers are at a loss to know just what to do, as they have no storage facilities to take care of any large quantities for future emergencies. One large consumer of steam fuel has now under construction a yard where he can store 40,000 tons. The car shortage is becoming more serious day by day. The railroads, realizing the urgency of the situation, are continuing to sound warnings to all the shippers.

The market is a little unsettled. The prevailing prices are as follows:

	W.Va.	Smokeless	Pittsburgh	Hocking
Domestic lump	$1.70			$1.60
Lump and egg		$2.25		
¾ lump	1.25		$1.20	1.25
Washed nut				1.45
Washed pea				1.15
Mine-run	1.10	1.30	1.10	1.10
Slack		1.05		

Anthracite—The anthracite situation is becoming very serious, and as predicted, the prices have advanced 50c. per ton on all sizes. It is out of the question to get this fuel in any quantities whatever.

Coke—What the coke situation will be when the winter sets in is hard to determine now. It is everybody's belief that a shortage will be possible. The advance on coke up to the present time is about 15c. above normal market conditions.

Chicago

A decided increase in strength is noticeable in the Chicago coal market. Beginning Sept. 1, coke prices advanced all along the line. The byproduct, egg, stove and nut, as well as gas house, now command from $4.75 to $4.85.

There is a wide variation in the price of screenings. Low-grade screenings sell from 45 to 50c., while the higher grades command all the way from 55 to 70c. a ton. Large shippers of Hocking coal are still behind in their orders, on account of a shortage in cars. An advance to $1.65 at the mines is regarded as certain. The price of smokeless coal remains firm at $1.25 for mine-run and $2 to $2.25 for lump and egg. New circulars on Franklin County coal, effective Sept. 1, brought the lump and egg and No. 1 nut up to $1.75, as compared with $1.60, the price previously in effect.

Prevailing prices at Chicago are:

	Sullivan Co.	Springfield	Clinton	W.Va.
4-in. lump	$2.37@2.47			
Domestic lump		$2.32	$2.27	
Egg	2.37@2.47			4.05
Steam lump		1.97	2.12	
Mine run	1.99½	1.87	1.92	3.30
Screenings	1.47@1.52	1.27	1.27	

Coke—Prices asked for coke are: Connellsville, $5@5.10; Wise County, $4.85@5; byproduct, egg and stove, $4.75@4.85; byproduct, nut, $4.75@4.85; gas house, $4.75@4.85.

Minneapolis—St. Paul

Activity still prevails in the Twin Cities and the Northwest, and coal men generally are very optimistic and believe that a good season is approaching. The domestic trade is now growing better and dealers are placing orders for larger shipments. Consumers are ordering their coal for the winter's supply and retailers in the Twin Cities during the past week have been working overtime.

The steam business is growing better and many plants are demanding a larger tonnage to keep pace with the increased activity in manufacturing lines. Prices on all steam sizes rule firm and the tendency is to advance rather than to shade quotations.

Anthracite shipments are coming into the Twin Cities a little better than heretofore, with the exception of stove size, which it is almost impossible to get. Prior to this year stove has been crowded onto the Western market and chestnut was always scarce, but now it is just the

reverse. Dock men claim the supply of stove is being taken in the East. In the cities where hot-water plants and furnaces are used stove coal is in greater demand than nut, while in the country where base-burners are used chestnut is in demand and very little stove.

The cargo of over 8000 tons of stove coal which recently sunk in Lake Superior cuts quite a hole in the visible supply of this size. Prices on Illinois coal remain firm in most cases.

St. Louis, Mo.

The first of September brought a decided change in the St. Louis market, especially on the high-grade fuels. Carterville coals all went up, with the exception of screenings, which are unsteady. Mount Olive grades remained unchanged, and Standard went up slightly. There is a good local demand, and the retail business is moving splendidly.

Indications are that from this time on the market will continue to advance. There is a decided car shortage on all roads, and the motive power is being taken away from the coal districts for the movement of grain from the Northwest. The Frisco Lines have only 60 per cent. of their coal equipment on their own lines. It is understood the Illinois Central has about 50 per cent. of its equipment, and the Iron Mountain is not any better off.

The mines in southern Illinois are only working about three or four days per week on account of the car supply. The present week has been a rather poor one in the way of coal production, on account of Labor Day and the numerous county fairs being held in the different coal producing counties.

The prevailing prices are:

Franklin County	
Lump and egg	$1.50@1.75
No. 1 nut	1.35@1.50
No. 2 nut	1.15@1.25
2-in. screenings	0.50@0.60
Carterville	
Lump and egg	$1.50@1.65
No. 1 nut	1.15@1.25
2-in. screenings	0.45@0.55
Mine-run	1.10@1.15
No. 1 washed	1.60@1.75
No. 2 washed	1.25@1.35
No. 3 washed	1.15@1.25
No. 4 washed	0.90@1.00
No. 5 washed	0.50@0.60
Mount Olive	
6-in. lump	$1.35
2-in. lump	1.25
Standard	
6-in. lump	$1.10@1.15
2-in. lump	0.90@0.95
Screenings	0.45@0.50

There is no anthracite moving in, and no byproduct coke arriving. Gas-house coke is in good demand with supply rather plentiful. Smokeless coal is moving in slowly and is in fairly good demand, and hard to get.

Portland, Ore.

As a result of the reduction in freight rates, coal will in the future be shipped into Portland from the Utah fields. The first car will arrive here in a few days. The reduction in the rate was announced a few weeks ago by the Interstate Commerce Commission. The Utah coal will be laid down and sold here at the same figures, it is said, as Wyoming coal.

No Australian coal has yet been booked for this city so far, and it is now very likely that none will come this season. Charter rates are held too high to admit of bringing the coal in competition with the Wyoming, Utah and Washington products. Although the mines announced an advance of from 40 to 50c. per ton, the retail price here has not yet changed, $10 and $10.50 being the quotation on ton lots of the best grades for domestic purposes. Business is improving now that fall is approaching.

Production and Transportation Statistics

Imports and Exports

The following is a comparative statement of imports and exports in the United States for June, 1911-12, and for the 12 months ending with June of the current year, in long tons:

	June 1911	June 1912	12 Months
Imports			
Anthracite	.....	.....	2,189
Bituminous	76,161	133,095	1,300,242
Exports			
Anthracite	340,664	301,969	2,979,102
Bituminous			
Canada	1,073,823	1,058,763	10,671,982
Panama	.....	40,740	488,152
Mexico	28,471	38,640	344,712
Cuba	85,155	89,048	1,121,580
West Indies	31,834	42,657	691,883
Other Countries	91,814	90,641	1,391,538
Total	1,311,097	1,360,489	14,709,847
Bunker Coal	586,183	567,162	7,093,212
Coke	95,352	59,164	805,819

Pennsylvania Railroad

Statement of coal and coke carried on the P. R.R. Co.'s lines east of Pittsburgh and Erie during July and the first 7 months with the increase or decrease over the same period last year, in short tons:

	July	7 mos.	Difference
Anthracite	952,741	5,525,010	—1,292,744
Bituminous	3,655,387	26,175,168	+3,012,309
Coke	1,077,047	7,451,340	+1,387,192
Total	5,685,175	39,151,518	+3,106,757

Atlantic Coastwise Movement

The following is a comparative statement of the fuel shipments from five principal Atlantic ports for June, 1911-12, and for the six months of the current year, in long tons:

Port	June 1911	June 1912	Six Months
New York	1,861,431	2,067,005	12,758,959
Philadelphia	569,416	587,156	3,168,493
Baltimore	381,705	328,879	1,933,276
Newport News	190,562	184,924	1,430,104
Norfolk	390,860	436,323	2,570,077
Total	3,393,974	3,604,287	21,860,909

Statement covers more than 90% of fuel handled at ports noted, and includes bunker coal supplied vessels in foreign and domestic trade. Tonnages for Norfolk include amount shipped by Virginian Ry. at Sewells Point.

Foreign Markets.

Great Britian

New business continues to be conducted on somewhat narrow lines, but as most collieries are well supplied with tonnage they are able to hold out steadily for best prices. Prices are approximately as follow:

Best Welsh Steams	$4.14 @ 4.20
Best Seconds	3.96 @ 4.08
Seconds	3.78 @ 3.90
Best Dry Coals	4.08 @
Best Monmouthshires	3.78 @ 3.84
Seconds	3.54 @ 3.60
Best Cardiff Smalls	2.78 @
Seconds	2.59 @

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, exclusive of wharfage, and for cash in 30 days—less 2½%.

Spanish Imports

The following is a comparative statement of Spanish imports for the first six months of this year and last year:

	1911	1912
Coal	1,035,396	1,072,419
Coke	160,532	192,763

Financial Notes

New York & Wilkes-Barre Coal Co.—This company's holdings of securities are advertised for sale at auction by Adrian Muller & Son. Holders of the company's $600,000 6% bonds, are said to have given practically unanimous consent to the plan.

Milburn Coal & Coke Co.—This company has 3000 acres of coal land under a term lease of 50 years. Capital stock of the company is $200,000 common and $100,000 preferred. The company began operations in November, 1910, and now has a capacity of 800 tons per day.

New River Co.—New England interests hold approximately 55% of the stock of this company; Scranton interests, 25%, and the Southern and scattered interests, 20%. As the Board is now constituted, New England and the allied Scranton interests control 12 out of the 15 members.

Colorado Fuel & Iron Co.—When the Rockefellow interest assumed control of this concern, it was a loosely strung out and loosely operated corporation. In the last decade approximately $15,000,000 has been expended on the property to bring it to a high operating efficiency. A large portion of this was advanced by John D. Rockefeller personally, who took as collateral the company's bonds, $11,500,000 of which, he gave to his general education board.

Reading Co.—The floating supply of the stock of this company becomes smaller every year. More than ⅔ of the $70,000,000 is held outright by corproations and great capitalists. The Reading interests of J. P. Morgan and George S. Baker and their associates total heavily. During the recent labor deliberations, President Baer, of this company, told the miners to examine the books themselves and see that the company was making no money, while on the other hand Reading's March statement showed an increase of over $1,000,000 net.

Paint Creek Collieries Co.—Through the ownership of $1,250,000 first mortgage 5% bonds of the Crescent Coal & Land Co., this company has a fee interest in 17,000 acres of valuable coal land. As these bonds are held in the sinking fund of the company, they offset a like amount of Paint Creek 5% bonds, leaving interest to be earned only on a net amount of $1,650,000 Paint Creek, 5s. Taking into consideration the $1,250,000 of the Crescent Coal & Lumber, first 5s. as an offset, the Collieries Co. is bonded for about $80 per acre against about $150.00 per acre on Lackawanna Coal & Lumber Co.

Prices of Mining Supplies

Current Prevailing Prices of Mining Commodities Compiled as a Convenient Reference for Buyers

THE MARKETS IN GENERAL

With each succeeding week comes new evidence of an enlarged trade and a greater volume of business. This is not confined to any one section of the country, nor any class of business, but is general and widespread. In the hope of keeping up with orders, manufacturers are working their plants day and night; but even with this expedient, orders unfilled continue to accumulate.

Crop conditions are largely responsible for the spread of prosperity. The government crop report indicates that the total harvest of the United States will be larger than ever before. Record-breaking crops, however, are indicated in only a few lines; but in all of them, the expectation is that the yield will be above normal, and, in some few, new high records will be set. This means general prosperity to agricultural interests in all sections, and not a bountiful yield in one part of the country, which is to be offset by meager returns in other sections.

Shipping is coming in such a large volume that ship owners are making contracts for new vessels, and the shipbuilding industry of this country is more prosperous than before in a generation.

LABOR

The scarcity of labor is just as marked as ever, and is felt in all lines. Farmers are paying record-breaking prices for harvest hands; mill owners are searching the country for additional workmen, and contractors, despairing of securing any additional help, are working their present forces to the limit.

Complaint is more frequent regarding the attitude of the government and immigration authorities in rejecting able-bodied men, physically able to do the work for which they are needed in large numbers. The immigrants are rejected because they are not able to pass the educational test. The work they will be called upon to do will never require any great degree of intelligence, and, as to their becoming citizens, they are perhaps more useful to the commonwealth than some of the well educated from northern Europe.

In the year ending June 30, 1912, 838,000 immigrant aliens arrived at United States ports. This is the smallest number since 1909, and compares most unfavorably with the record of 1905 and 1906, when over 1,000,000 immigrants arrived, with 1907, when 1,285,000 arrived, and with 1910, when there were 1,040,000.

IRON AND STEEL PRODUCTS

Each month the news is a repetition of the preceding month, with a little added. More orders have been received, more orders have been filled, but still steel manufacturers have a larger unfilled tonnage on their books than before. In a year the unfilled orders of the U. S. Steel Corporation increased over 2,000,000 tons. Consumers all over the country are urging delivery. The largest users of iron and steel products purchased early in the year in anticipation of such demand, and they have followed this buying with other orders, so they may have a sufficient stock for the business of next year. Those less familiar with the steel trade, and who have hesitated to buy as their demand warranted, are finding themselves under a serious handicap, which will probably increase as time passes.

Price changes have been general. Pig iron has advanced in all centers, mine timbers, structural steel, cast-iron pipe, wrought pipe have again advanced, nails and wire are higher by $1 per ton than last month, and the outlook seems to point toward even higher figures.

Old Material—Strength is apparent in all markets, and there is a good buying demand from consumers in all parts of the country. Larger lots are being purchased than formerly, and it is going to be more a question of delivery than of price. Quotations per gross ton, New York are as follows:

Heavy-melting steel scrap..	$11.25@11.75
No. 1 railroad wrought.....	13.75@14.25
Pipes and flues.....	11.00@10.50
Cast borings.....	7.00@ 7.25
Machinery cast, broken up .	11.50@12.00
Stove plate.....	8.75@ 9.00
Malleable castings.....	10.00@10.50
Wrought turnings.....	8.50@ 8.75

In Chicago, the largest consumers seem to have plenty of stock for present needs, and they are not buying freely, although they would snap off any large offer at a concession in price. Quotations are as follows:

	Per gross ton
Heavy, melting steel scrap..	$12.00@12.50
	Per net ton
No. 1 railroad wrought.....	$12.25@12.75
No. 2 railroad wrought.....	11.25@11.75
No. 1 cast scrap.....	12.25@12.75
Pipes and flues.....	9.50@10.00
Agricultural malleable.....	10.75@11.25
Railroad malleable.....	12.25@12.75

The Pittsburgh market reflects the activity in the line of finished iron and steel. All kinds of scrap are in good demand at advancing quotations. The market is not as firm as it has been at other times when the demand for steel was so insistent, but this will probably come later. Quotations, f.o.b. Pittsburgh, per gross ton, are as follows:

Rerolling rails.....	$15.00@15.25
No. 1 cast scrap.....	13.00@13.25
Heavy-melting steel scrap..	13.75@14.00
Old car wheels.....	14.00@14.25
Machine-shop turnings....	10.75@11.00
Stove plate.....	11.25@11.50
Grate bars.....	9.75@10.00

Roofing, Corrugated—Another advance of $1 per ton was made Aug. 15. The mills are straining every effort to turn out as large a tonnage as possible, but specifications are crowding on one another so fast that deliveries are only made in eight to ten weeks after specifications are received. Many of the largest jobbers had large stocks on hand, and are selling sheets from store at slightly less than store prices and giving immediate delivery.

The price of black sheets per pound f.o.b. Pittsburgh, in carload lots are as follows:

	Cents per lb. Black	Galvanized
Nos. 23 and 24.....	1.90	2.65
Nos. 25 and 26.....	1.95	2.85
No. 27.....	2.00	3.00
No. 28.....	2.05	3.15
No. 29.....	2.10	3.25
No. 30.....	2.20	3.45

In Chicago store prices are as follows:

	Cents per lb. Black	Galvanized
No. 24.....	2.35	3.05
No. 26.....	2.40	3.25
No. 27.....	2.40	3.60
No. 28.....	2.50	3.60
No. 30.....	2.65	3.80

The extras for corrugation are unchanged at 5c. per 100 lb., for 2-, 2½- and 3-in. corrugation; painting, gages from 25 to 28, 15c. per 100 lb.; gages 19 to 24, 10c. per 100 lb.; heavier gages, 5c. per 100 lb.

Cast-Iron Pipe—Considerably higher prices have been quoted in Chicago where the demand has been greatest, but otherwise quotations are about the same as a month ago. The reason for the stationary level of prices is the absence of any demand for the raw material, which has increased in cost to a considerable degree. Quotations per net ton of 2000 lb. are as follows:

Chicago, 4-in., $30; 6- to 12-in., $28 larger sizes, $27.

New York, 6-in., $22 to 23.

Birmingham, Ala., 4-in., $24; 6- to 8-in., $22; 10-in. and over, $21.50.

Gas pipe is $1 per ton higher in all markets.

Steel Rails—A shortage of rails next year is among the possibilities. The Western railroads, particularly those in the northwest, have purchased largely for 1913 delivery, and this is unusual. Under ordinary circumstances they would not place their orders before October. The reason for orders being placed so early in the year is because railroads fear that they will be unable to secure their supplies as promptly as they wish, should they defer buying. .

Prices continue unchanged at $28 for standard sections of bessemer rails and $30 for openhearth rails. Girder rails in 30-ft. lengths are $38.40 per gross ton, and in 60-ft. lengths, $40.40 per gross ton f.o.b. New York.

Other quotations f.o.b. Pittsburgh are as follows: Standard sections, 50 to 100 lb. per yd., 1.25c. per lb.; 40 to 50 lb. 1.21c.; 12 lb., 1.25c. Relaying rails of standard sections are $24. In New York relaying rails are $22 to $23. In Chicago carload lots of light rails are quoted as follows: 25 to 45 lb., 1.20 to 1.25c.; 15 to 20 lb., 1.25 to 1.30c.; 12 lb., 1.30 to 1.35c.; 8 lb., 1.35 to 1.45c.

Steel Mine Timbers—An advance of $2 per ton has been made by manufacturers and 1.40c. per lb. is now quoted, f.o.b. Pittsburgh. It is possible that this quotation might be somewhat shaded on a desirable order.

Track Supplies—Angle bars are $1.60, and track bolts $2.10@2.20. In Chicago angle bars are $1.50, spikes $1.75, base and track bolts with square nuts, $2.10@2.15. All of these prices are per 100 lb.

Bars, Concrete Reinforcing—Another advance of $1 per ton was made in reinforcing bars in August. The new price is on a basis of 1.35c. Pittsburgh, this applying to bars ¾ in. and larger. Other prices are: 1.40@1.50c. for ⅝-in., 1.45@1.55c. for ½-in.

Wire Rope—Prices continue unchanged. The discount to the larger trade is 42½ and 5% from list for galvanized, and 50 and 5%, for bright. See page 33 of the issue of July 6 for table of prices.

Merchant Pipe—The demand is phenomenal. Manufacturers are straining every effort to turn out as large a tonnage as possible. An advance amounting to about 5% was made last month.

The discounts on steel pipe f.o.b. mill at Pittsburgh are as follows:

	Black	Galvanized
¼- to 1¼-in. butt welded..	79%	71%
2-in. lap welded.....	77%	70%
2½- to 4-in. lap welded...	79%	72%
4½- to 6-in. lap welded...	78%	70%
7- to 12-in. lap welded...	76%	66%

At these discounts the net prices of pipe per foot at Pittsburgh are as follows.

	Steel pipe incents per ft. f.o.b. mill	
	Black	Galvanized
¼-in.	2.40	3.35
⅜-in.	3.50	4.80
½-in.	4.70	6.55
¾-in.	5.65	7.80
1-in.	8.30	10.80
1¼-in.	12.00	16.10
1½-in.	15.80	21.10
2-in.	22.60	30.00
2½-in.	32.00	43.50
3-in.	41.40	56.50
3½-in.	56.30	80.00
4-in.	60.00	85.00
4½-in.	82.00	$1.16
5-in.	84.00	1.19
6-in.	$1.08	1.53
7-in.	1.18	1.67

Nails—Due to an increasing demand, the price of nails has again advanced, this time $1 per ton. Quotations are as follows: Carload lots of wire, f.o.b. Pittsburgh, $1.75 to retail merchants and consumers. For less than carload lots, the quotation is $1.85, and cut nails are $1.65, Pittsburgh. In New York, wire nails are $1.90@1.95; cut nails, $1.85@1.90. In Chicago, carload lots are $1.93, and less than carload lots, $2.03. All of these prices are per keg of 100 lb.

Merchant Shapes—On account of the congestion at the mills, many consumers are buying iron and steel from jobbers, as this is the only way prompt delivery can be made. There is some irregularity in quotations because many of the jobbers have large stocks on hand purchased at considerably lower prices, and they are willing to shade the present prevailing rate for a desirable order from a good customer. Quotations from store New York are as follows:

	Cents per lb.
Refined iron:	
1- to 1¼-in. round and square....	1.80
1½- to 4-in.x¼- to 1-in.....	1.80
1½ to 4-inx¼- to 5-in.....	1.80
Rods:	
¼- and 11/16-in. round and square..	1.90
Angles:	
Base.....	2.05
3x¼-in. and larger.....	2.05
3x¼-in. and ¼-in.....	2.45
1½ to 2½x¼-in.....	2.20
1½ to 2¼x⅜-in. and thicker.....	2.10
1 to 1¼x⅛-in.....	2.20
1 to 1¼x¼-in.....	2.25
1½x¼-in.....	2.35
1¾x¼-in.....	2.40
2x¼-in.....	2.60
Tees:	
1-in.....	2.50
1¼-in.....	2.35
1½ to 2½x¼-in.....	2.15
1½ to 2½x⅜-in.....	2.15
3-in and larger	2.10
Beams.....	2.05
Channels, 3-in. and larger.....	2.05
Bands, 1½ to 6x-⅜in. to No. 8.....	2.15
"Burden's Rest" iron, base price....	3.15
Burden's "H .B. & S." iron, base price.....	2.95
Norway bars.....	3.60
Bessemer machinery.....	1.70
Cast steel, base.....	7.00
Special cast steel, base.....	14.00

Lag Screws—The market is strong, but quotations are unchanged, lag screws being sold at a discount of 80% from list. The table of net prices will be found on page 34, issue of July 6.

Spiral Riveted Pipe—Quotations continue without change; those given in the issue of July 6 are the net prices, f.o.b. factory, freight being equalized with New York. The price is figured at a discount of 50, 10 and 10% from list.

Piling, Sheet Steel—The market is firmer, and 1.45c., f.o.b. Pittsburgh, is quoted. Deliveries are fairly prompt, being made in ten days after receipt of specifications.

Wire—An advance of $1 per ton has been made, and the new prices of wire are $1.75 for plain barbed wire and $2.05 for galvanized, f.o.b. Pittsburgh. Painted wire in Chicago is $1.88 and galvanized is $2.18. These prices are per 100 lb.

MILL SUPPLIES

Shafting—Consumers all over the country are buying shafting in large quantities. A slight change has been made in quotations, and the discounts on carload lots are now 64% from list, for less than carload lots, 59% from list. Delivery made on carload lots in base territories is equalized in other territories.

The following net prices per foot are based on the discount of 59%:

COLD-ROLLED SHAFTING

Diameter, inches	Cents per foot
¾	3.70
1	6.00
1¼	9.40
1½	12.30
1¾	16.80
2	21.95
2¼	27.60
2½	34.20
2¾	41.50
3	49.50
3½	73.00

Belting—The market is very firm, but no change has been made in quotations. Discounts on leather belting are as follows: Extra heavy, 50 to 50 and 5%; heavy, 50 and 10 and 5 to 60%; medium, 60 and 10 to 60 and 10 and 5%; light, 60 and 10 and 10 to 70%; Standard, 70 to 70 and 10%.

The discounts applying to rubber belting are unchanged, best grades being held at 40 and 10% to 50%. Standard, 50 and 10% to 60%. Competitive grades are 60, 10 and 10% to 70%.

The price of leather belting is, as stated, unchanged from last month. The net prices may be found on page 75 of the issue of Aug. 1.

The net prices per foot of rubber belting figured at the above discounts are as follows:

RUBBER BELTING, NET PRICE PER FT.

Width, Inches.	2-ply.	4-ply.	6-ply.	8-ply.
3	$0.16	$0.22	$0.33	.....
4	.21	.30	.45	.....
5	.26	.44	.55	.....
6	.30	.51	.65	$0.87
7	.36	.55	.75	1.01
8	.40	.57	.87	1.15
9	.46	.64	.96	1.30
10	.51	.72	1.01	1.44
12	.60	.86	1.30	1.70
14	.72	1.01	1.53	2.01
16	.83	1.17	1.76	2.35
18	.93	1.34	2.00	2.65
20	1.04	1.49	2.25	2.98
22	1.17	1.67	2.50	3.33
24	1.30	1.85	2.76	3.70
26	1.42	2.04	3.06	4.08
28	1.58	2.22	3.33	4.45
30	1.69	2.40	3.60	4.80
34	1.94	2.79	4.16	5.54
38	2.22	3.15	4.70	6.30
42	2.46	3.50	5.30	7.00
46	2.75	3.88	5.80	7.72
50	3.02	4.25	6.40	8.50
56	3.40	4.80	7.20	9.60
60	3.67	5.20	7.80	10.40

MISCELLANEOUS

Petroleum Products—No change has been announced in the price of either kerosene or gasoline this month, kerosene being held at 8c. per gal. and gasoline at 19¾c.

Copper Wire—The demand is large, and comes from all parts of the country. The makers of wire are buying copper more freely than ever before. Deliveries of the finished products are fairly satisfactory. Quotations are somewhat uneven, but the base price is 18¾@19¼c.

Aluminum Wire—The price is unchanged at 31c. base.

Rope—Considerably higher prices have been named for rope, due to the enormous demand for all kinds of hemp products. Manila rope of the first grade is now quoted at 11c. per lb., compared with 8½c. a month ago; second grade, 10c. per lb., and hardware grade, 9c. per lb.

Paper—Consumers all over the country are using more building paper than ever before. The market is strong, but prices are unchanged as follows:

Per Roll of 500 Sq.Ft.

Rosin sized sheathing, 20 lb.....28c.
Rosin sized sheathing, 30 lb.....43c.
Rosin sized sheathing, 40 lb.....58c.

ROOFING, RUBBER

Per Roll of 108 Sq.Ft.

1 ply—35 lb.....	$0.90
2 ply—45 lb.....	1.10
3 ply—55 lb.....	1.30

Tarred felt is $1.45 per 100 lb. in 1, 2 and 3 ply. Slaters' felt is 60c. per roll.

Portland Cement—Manufacturers of portland cement are not as anxious to quote on long-time contracts as they were a month ago, and in some cases higher prices have been named for work, most of which will be done in 1913. Cement manufacturers have also introduced another change, and charge 6c. more per barrel for cement inspected and held in sealed bins for state, government and railroad work. In New York, cement is quoted at $1.38 per bbl., with an allowance of 40c. for bags returned, making a mill price in the Lehigh Valley district of 67@70c. per bbl. Other quotations may be computed on a basis of the price in the Lehigh Valley.

Brattice Cloth—The sellers of brattice cloth still complain of the high price of raw material, and there seems to be no relief in sight for this year, in any event. Sellers voice the opinion that lower prices will not be named for several months at least, and point to the higher quotations now ruling for rope, twine and like products as substantiating the fact that the prevailing prices for brattice cloth are the result of a shortage in the jute crop.

Fire Hose—Prices of hose are unchanged. The standard grade of underwriters' cotton rubber-lined hose, 2-in. diameter warranted, 350 lb. pressure, is sold in 50-ft. lengths complete with couplings at 65c. per ft. Common hose, 2½-in. diameter, tested to 200 lb. pressure, is 35c. per ft.

Cotton Waste—Prices are as follows in bales of 100 to 500 lb.: No. 1 white picked cotton waste, 9¼c. per lb.; No. 3, 7¼c.; No. 1 colored, 5c.; No. 3 colored, 4¼c.

Chain Belting—Prices continue unchanged. Quotations are as follows: From 3 hp. to 10 hp., 30-in. centers complete the two sprockets, $7@8 per horsepower. From 10 hp. to 25 hp., 36-in. centers complete, $5@6 per horsepower. For 25 hp. to 100 hp., 50-in. centers complete, $4@5 per horsepower. From 100 hp. to 500 hp., 72-in. centers complete, $3@4 per horsepower.

Lubricating Oils—Quotations continue without change, the following figures being named for 5-bbl. lots:

	Cents per gal.
*Cylinder, dark.....	20@27
*Cylinder, steam, refined.....	14@22
Neutral oils, filtered:	
Stainless white, 32 to 34 gravity..	28@29
Lemons, 33 to 34 gravity.....	17@19
Dark, 32 gravity.....	15@18
Crank case oil.....	15@17

*Prices are according to test.

Packing—Prices are unchanged from last month, asbestos wick and rope being quoted at 13c.; sheet rubber, 11@13c.; pure gum rubber, 40@45c.; red sheet, 40@50c. Cotton packing can be had at 16@25c.; jute at 3¼@3½c., and Russian at 9 to 10c.

Telegraph Wire—For lots of fair size, the wire measured in Birmingham wire gage, the prices in cents, per lb., are as follows: "Extra Best Best," Nos. 6 to 9, 4⅜c.; Nos. 10 and 11, 4½c.; No. 12, 4⅝c.; No. 14, 5⅛c. "Best Best," Nos. 6 to 9, 3½c.; Nos. 10 and 11, 3⅝c.; No. 12, 3½c.; No. 14, 4c. Actual freight is allowed from Trenton, N. J., where it does not exceed 25c. per 100 lb.

Insulators—Prices are without change. Glass insulators in lots of more than 1000 and less than 10,000 are sold at the following prices per 1000: Double petticoats, 20 oz., $33; Western Union, $30.25; No. 2 cable, $53.90; No. 4 cable, $210; Muncie type, 7-in., $236.50; No. 3 triple petticoat, 4½-in., $90.75.

Explosives—Dynamite of the kind usually used by contractors is approximately 11@13c. per lb., f.o.b factory, in ton lots. Blasting powder, classified as "soda" grade, is sold at $1.20@1.40 per keg of 25 lb. in lots of 10,000 lb.

Exploders, per hundred, are sold at the following prices: 4 ft., $3.60; 6 ft., $4.10; 8 ft., $4.60; 10 ft., $5.10; 12 ft., $5.60; 16 ft., $6.60; 20 ft., $7.50; 26 ft., $9.40; 30 ft., $12; 36 ft., $14.60.

Caps in lots of 10,000 are $7@8 per thousand.

Blasting machines for 10 holes are $12; 25 holes, $20; 50 holes, $40; 100 holes, $60.

Asbestos—Asbestos building felt and sheating in less than ton lots is 3½c. per lb. for the light, weighing from 6 to 30 lb. per 100 sq.ft.; 4c. per lb. is charged for the heavy, weighing from 45 to 56 lb. per sq.ft.

Millboard is made in standard sheets, 40x40 in., and 41x40 in. It varies in thickness from 1/32 to 1/8 in. and in weight from 2 to 27 lb. per sheet. The net price in 100-lb. lots is 5c. per lb.

Index of Coal Literature

Monthly list of the world's best articles on coal and coal mining

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Am. Lab. Legis. Rev. = American Labor Legislation Revue.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Austral. Min. Stand. = Australian Mining Standard.
Berg-Huttenmänn. Rdsch. = Berg- und Huttenmännische Rundschau.
Bull. Am. Inst. Min. Eng. = Bulletin American Institute of Mining Engineers.
Can. Eng. = Canadian Engineer.
Can. Min. Jl. = Canadian Mining Journal.
Chem. Eng. = Chemical Engineer.
Coll. Guard. = Colliery Guardian.
Comp.-Air Mag. = Compressed Air Magazine.
Compt. Rendus Acad. Sc. = Comptes Rendus de l'Académie des Sciences.
El. Eng. = Electrical Engineering.
El. Jl. = Electrical Journal.
El. Kraftbetr. = Electrische Kraftbetriebe und Bahnen.
Eng. Contract. = Engineering Contractor.
Eng. Min. Jl. = Engineering and Mining Journal.
Eng. News = Engineering News.
Fördertechnik = Die Fördertechnik.
Geol. Mag. = Geological Magazine.
Handel und Ind. = Handel und Industrie.
Int. Mar. Eng. = International Marine Engineering.
Inst. Min. Metal. = Institute of Mining and Metallurgy.
Int. Volkswirt = Internationaler Volkswirt.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Ind. Engin. Chem. = Journal of Industrial and Engineering Chemistry.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. S. Afr. Inst. Eng. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Lumière El. = Lumière Electrique.
Min. Eng. = Mining Engineer.
Mines Minerals = Mines and Minerals.
Min. Sc. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mon. Ind. Gaz. = Moniteur de l'Industrie du Gazet de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift fur Berg und Hüttenwesen.
Portefeuille Econ. Machines = Portefeuille économique des machines.
Proc. Acad. Pol. Sc. N. Y. = Proceedings of Academy of Political Science, New York.
Proc. Am. Inst. El. Eng. = Proceedings of American Institute of Electrical Engineers.
Proc. S. Wales Inst. Eng. = Proceedings of South Wales Institute of Engineers.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Saarbrucker Berg. Kal. = Saarbrucker Bergmanns Kalendar.
S. Afr. Min. Jl. = South African Mining Journal.
Soz.-Technik = Sozial-Technik.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Tech. Rdsch. = Technische Rundschau.
Techn. Wirtsch. = Technik und Wirtschaft.
Tekn. Tidskrift = Teknisk Tidskrift.
Trans. Inst. Min. Eng. = Transactions Institute of Mining Engineers.
Trans. Min. Inst. Scot. = Transactions of Mining Institute of Scotland.
Trans. Inst. Min. Eng. = Transactions of the Institute of Mining Engineers.
Trans. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. Damptkessel-Betr. = Zeitschrift für Dampfkessel und Maschinenbetrieb.
Z. El. Mach. = Zeitschrift für Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

I—GENERAL

Conservation of Coal. (Conservation du charbon) "Bull. Soc. Ing. civils France." vol. 65. 1912. 3. pp. 468-9.

Coal and its Products. (Kul og. Kulprodukter.) Alf. Stage. Treatise for University Students. 8vo. 16 pp. Ersley, Kjoebenhavn. 40c.

System of Keeping Underground Costs and Records. G. H. Smith. "Jl. Chem. Metall. Min. S. Afric." vol. 12. 11. pp. 447-56. 7 fig. 1 dble plate. 75c.

Alaska's Lamented Coal Mining Industry and Conservation. A. H. Brooks. "Min. Eng. World." vol. 37. 4. pp. 139-40. and pp. 153-6. 1 map. 1 tab. 10c.

Mineral Resources of the Philippine Islands. R. Arthur. "Min. Eng. World," vol. 37. 3. pp. 107-9. 1 map. 10c.

The Coal Supply of Manchuria. E. Di Villa. "Min. Sci. Press." vol. 105. 2. pp. 53-4. 1 map. 10c.

Japanese Coal Mining Industry. "Iron Coal Tr. Rev." vol. 85. 2316. p. 89. 1 tab. (The quality of the coal and methods of mining.) 30c.

Defects and Deficiencies of American Mining Laws. H. V. Winchell. "Min. Eng. World." vol. 37. 4. pp. 145-7. 10c.

Mining Laws in the Province of Quebec. J. Obalski. "Canad. Min. Jl." vol. 33. 13. pp. 431-2. 40c.

The Coal Mines Act, 1911, and other Acts Affecting Mines and Quarries. With a Commentary. R. F. McSwinney. Ryl. 8vo. Sweet & M., London. $1.50.

Mining Regulation of September 20th, 1906, for the Portuguese Colonies. (Reglement minier du 20 septembre 1906 des colonies portugaises) "Ann. Mines." vol. 1. 1912. 5. pp. 457-68.

Remarks on the Minimum Wage and Agreement by Piece Work. (Einiges uber Mindestlohn und Gadinge.) E. Graf. "Stein- u. Braunkohle." 1912. 11. pp. 131-3. 35c.

Government Mining and the Premium-Wage System. (Der Staatsbergbau und die Pramienlohnsysteme.) Wiessner. Collection of mining and metallurgical essays, No. 101. Kattowitz. Bohemia. 1912. 50c.

German Coal Trade with Italy. "Coal Merchant." vol. 25. 618. pp. 79-80. 15c.

The Development of the Traffic on the Dortmund Ems Canal. (Die Entwicklung des Verkehrs auf dem Dortmund-Ems-Kanal.) "Gluckauf." 1912. 23. pp. 917-20. (Statistical data showing the continually growing importance of the canal.) 75c.

The Coal Export of Germany and its Importance for the Various Districts of the Country. (Die Steinkohlenausfuhr Deutschland und ihre Bedeutung fur die verschiedenen Bergbaureviere des Landes.) Ernst Jungst. "Gluckauf." 1912. 24. pp. 955-62. 75c.

The Importance of the Rhine Navigation for the Coal Trade. (Die Bedeutung der Rheinschiffahrt fur den Kohlenhandel.) "D. Kohlenztg." 1912. 6. pp. 59-61. 7. pp. 72-4. 40c.

Statistics of the Upper-Silesian Mining and Metallurgical Works for the First Quarter of 1912. (Statistik der oberschlesischen Berg- und Huttenwerke fur das 1. Quartal 1912.) "Z. Oberschl. Bergmaenn. Veriens." 1912. 6. pp. 265-78. 40c.

Graphical Tables of the Share Quotations of Collieries in the Nord District of France, and Comments on Same. (Graphiques des valeurs de charbonnages du Nord de la France et commentaires.) Saint-Maur. "Rev. Noire." vol. 15. 1912. 391. p. 207. 3 fig. 50c.

II—GEOLOGY

Geological Research in the Coalfields of Great Britain. J. J. H. Teall. "Colliery Guard." vol. 104. 2690. pp. 120-1; 2691. pp. 172-3. 30c.

The Geological, Mineralogical and Paleontological Literature concerning the Saar-District up to 1910. (Die geologische, mineralogische und palaeontologische Literatur des Saarbeckens bis zum Jahre 1910.) Paul Kessler u. H., Willing. 8vo. 138 pp. Saarbruecken Schmidtke.

A New Marine Bed in the Flaming Gas Coal Section of the Ruhr Coalfield. Kukuk. (Eine neue marine Schnicht in der Gasflammkohlenpartie des Ruhrkohlenbezirks.) "Gluckauf." 1912. 24. pp. 947-9. 75c.

Bibliography of the Mineral Wealth and Geology of China. C. Y. Wang. 8vo. Ldn. C. Griffin. 1912. $1.00.

The Rapid Traverse as used in Cornwall Surveys. "Eng. Min. Jl." vol. 94. 2. pp. 78-9. 5 fig. 15c.

Prospecting for Minerals. S. H. Cox. 6th ed. rev. and enlarged. cr. 8 vo. 8x5¼. 272 pp. C. Griffin, London. $1.50.

Progress made in deep Prospecting at the Present Time. J. Stiny. (Fortschritte des Tiefenschurfes in der Gagenwart.) "Geo. Rdsch." 1912. 3. pp. 166-9. 75c.

Coal Prospects in the Fraser Valley, B. C. "Brit. Col. Min. Rec." vol. 17. 10. pp. 316-21. 75c.

Germany's Mineral Wealth. (Deutschlands Bodenschatze.) I. Coal and Salts. 8vo. 151 pp. 41 ill. 1 map. Leipzig, Quelle & Meyer. 1912. 50c.

Bear River Coal Field, B. C. C. F. J. Galloway. "Canad. Min. Jl." vol. 33. 10. pp. 335-6. 40c.

Coalfields and Collieries of Australia. F. D. Power. 8vo. Ldn. Critchley Parker, 1912. $7.00.

The Loss of Coal Areas. J. Meacham. "Colliery Guard." vol. 104. 2691. pp. 176-7. 15c.

The Valuation of Mineral Properties. T. A. O'Donahue. "Iron Coal Tr. Rev." vol. 85. 2317. pp. 118-9. 1 tab. (Continuation of discussion of the paper read.) 30c.

III—MINING TECHNOLOGY

Device for Driving Deep Boreholes, by Means of a Conical or Similar Mandrel Driven by a Tup. (Vorrichtung zum Bohren von tiefen Bohrlochern mittels eines durch einen fallenden Bar getriebenen. Kegelig oder ahnlich geformten Dornes.) "Vulkan" 1912. vol. 12. 10. p. 40. 2 fig. 50c.

Measuring Air Consumption in Drilling. G. H. Gilman. "Eng. Min. Jl." vol. 94. 1. pp. 28-9. 2 fig. (A displacement tank measuring apparatus.) 15c.

Brazilian Carbons. J. K. Smit. "Min. Minerals." vol. 32. 12. pp. 732-4. (How to judge the values of the different varieties used for diamond drilling.) 25c.

Use of Turbo-Compressors in the Mining Field. G. E. Edwards. "Min. Eng. World." vol. 37. 1. pp. 3-6. 8 fig. 10c.

Tests on an Electric Driven Piston Compressor. (Abnahmversuche an einem elektrisch angetriebenen Kolbenkompressor.) "Gluckauf." vol. 48. 16. pp. 636-41. fig. 75c.

Compressed Air, Its Generation & Application. V. E. Green. "B'ham. Eng. Min. Jl." vol. 10. 4. pp. 216-23. 5 fig. 50c.

Electric Coal Cutters. "Times Eng. Supp." vol. 8. 386. p. 21. (Considers some of the difficulties found in working.) 15c.

Central Coal Fields in Colorado. F. W. Whiteside. "Coal Age." vol. 2. 1. pp. 1-5. 6 fig. (The Walsenburg and Canon City districts. Each field has central power installations; notes are given of the construction of an aerial rope tram about a mile long, for mine car conveyance.) 10c.

Reinforced Concrete. T. E. Thain. "Iron Coal Tr. Rev." vol. 2316. pp. 81-3. 12

fig. 1 tab. (Gantries, pit-head structures, coke-hoppers, etc.) 30c.

IV—WORKING OF MINERALS

The Burnwell Coal Co. in Illinois. "Coal Age." vol. 2. 2. pp. 38-40. 3 fig. (The seam is about 8 ft. thick, and is worked on the panel system, the mule haulage is being replaced with electricity.) 10c.

Prevention of Accidents in Coal and Metal Mines in New Zealand. "Colliery Guard." vol. 103. 2687. pp. 1292-3. 3 tab.; 104. 2688. pp. 16-7.; 2789. pp. 72-3. 45c.

Government Mining Board. Mining Accident and Firedamp Department. Reports on Accidents. Ad. Breyre. (Administration des Mines. Service des accidents miniers et du gaisou, monographis d'accidents. Les asphyxies par les gaz des hauts-fourneaux. Revue analytique et critique des accidents survenus en Belgique de 1906 a 1911.) Lex. 8vo. 92 pp. Brussels, Lucien Narcisse. 1912. 75c.

(Asphyxiation by blast-furnace gas: Analytical and critical summary of the accidents in Belgium from 1906 to 1911).

V—BORING, SHAFT SINKING AND TUNNELING

Two Concrete Lined Mine Shafts. F. C. Auld. "Coal Age." vol. 2. 2. pp. 43-6. 5 fig. (Records of construction work on two 300 ft. shafts at Annabelle, W. Va. The account discloses some advantages of the circular form of shaft section.) 10c.

Application of Reinforced Concrete in the Place of Brickwork for Shaft-Sinking. (Verwendung von Eisenbeton beim Schachtbau an Stelle von Mauerwerk.) Elwitz. "Gluckauf." 1912. 23. pp. 910-3. (Discusses the conditions to be fulfilled if reinforced concrete is applied.) 75c.

VI—TIMBERING, PACKING, ETC.

Method of Shutting off Water-Bearing Strata or the Like by Means of Concrete. (Verfahren zum Abdichten wasserfuhrender Schichten oder dergleichen mittels Betons.) Georg Pauli. "Allg. oesterr. chem. Ztg." vol. 30. 8. pp. 90-1. 1 fig. 40c.

Timbering a Small Shaft. J. T. Fuller. "Min. Mineral." vol. 32. 12. pp. 743-4. 9 fig. 1 tab. 25c.

Preservation of Mine Timber, Cost and Results. E. W. Peters. "Min. Eng. World." vol. 37. 1. pp. 7-11. 5 fig. 1 tab. 10c.

VII—WINDING AND HAULAGE

A Method of Capping Winding Ropes. D. Jackson. "Trans. Ming. Inst. Scot." vol. 34. 5. pp. 161-3. 6 fig. $1.50.

Winding Ropes and Capels. W. D. Lloyd. "Colliery Guard." vol. 104. 2693. pp. 277-9. 15c.

Electric Mine Locomotive Operation. A. F. Elliott. "Eng. Min. Jl." vol. 94. 2. pp. 55-6. 2 tab. (Tables and formulas are given for use in determining the haulage capacity and efficiency.) 15c.

Recent Hauling Devices in Mines. (Neuzeitliche Fordermittel in Bergbaubetrieben.) "Techn. Echo." vol. 3, 1912. 3. pp. 36-8. 6 ill. (Belt conveyors and self-emptying cars for rapid discharge.) 40c.

Colliery Mine Car Construction. "Coal Age." vol. 2. 4. pp. 114-7. 10 fig. 10c.

Automatic Weighing Device for Determinating the Weight of the Content of Cars. (Selbsttatige Wiegevorrichtung zur Ermittlung des Wageninhaltgewichts.) Ernst. Blau. "Gluckauf." 1912. 22. pp. 871-3. (Description of entirely automatic device for determining the weight of minerals hauled in regular intervals.) 75c.

VIII—SIGNALING

Mine Telephone of Today. E. L. Cole. "Coal Age." vol. 2. 4. pp. 108-11. 10 fig. 10c.

IX—LIGHTING

A New Electric Miners' Lamp. D. B. Rushmore. "Bull. Am. Inst. Min. Eng." No. 67. pp. 739-46. 2 fig.

The Smith Gas Pump & Lamp. W. B. Lloyd. "Min. Minerals." vol. 32. 12. pp. 705-6. 3 fig. (A lamp test for gas in the air back of stoppings, and in roof gas traps as well as for testing samples from air of workings.) 25c.

X—VENTILATION

Fan-Driving by Three-Phase Cascade Motors at the Pit "Werne." (Ventilatorantrieb mit Drehstrom-Kaskadenmotor auf der Zeche Werne.) Zederbohm. "Gluckauf." 1912. 24. pp. 949-55. (Advantages of the Cascade motor as compared with the ordinary three-phase motor for fan driving on account of its simple speed regulation.) 75c.

Proposed Ventilation System. J. Davies. "Coal Age." vol. 2. 2. pp. 48-9. 1 plan. (A four-entry system embracing a 100 ft. carrier pillar of coal which serves to divide the mine into four separate districts, any one of which can be quickly converted into a rescue chamber of large size.) 10c.

XI—MINE GASES, TESTING

Analysis of Mine Air. J. W. Hutchinson. "Colliery Guard." vol. 104. 2690. pp. 117-9. 3 fig. 6 tab.; 2691. pp. 174.-5 30c.

Ministerial Decree of 23 February 1912. Specifying the firedamp indicators suitable for use in fiery mines. (Arrete ministeriel du 23 Fevrier 1912, agreant les indicateurs de grisou susceptibles d'etre employes dans les mines grisouteuses.) "Ann. Mines." vol. 1. 1912. 4. pp. 183-6. 1. fig. (Chesneau firedampmeter lamp.)

Testing with Safety Lamp for Fire-damp and Black-damp. H. Briggs. "Trans. Min. Inst. Scot." vol. 34. 5. pp. 135-52. 1 diagr. (Commencement of a discussion on the subject.) $7.50.

Refraction of Light in Firedamp. O. H. Hohn. "Coal Age." vol. 2. 4. pp. 122-3. 10 fig. (Testing apparatus for detecting minute percentages of firedamp and based on the difference in the refraction of light when methane is present.) 10c.

New Apparatus for Sampling Air in Mines for Dust. E. J. Laschinger. "Jl. Chem. Metall. Min. S. Afric." vol. 12. 11. pp. 443-7. 1 fig. 1 plate.

Physiological Effects of Carbon Monoxide! H. S. Munroe. "Schl. Min. Columb. Qr." vol. 33. 4. pp. 340-4. (A critica. consideration of the Buraeu of Mines pamphlet and the publications of Dr. J. S. Haldane on the subject.) 50c.

XII—COAL DUST

Dust Determination in Mines by Filtration through Sugar. A. Mc. A. Johnston. "Jl. Chem. Metall. Min. S. Afric." vol. 12. 11. pp. 442-3. 1 fig. 50c.

XIII—EXPLOSIONS

Mine Disaster, Hastings, Colorado. F. W. Whiteside. "Coal Age." vol. 2. 1. pp. 5-7. 6 fig. (The cause is ascribed to the improperly fitted gasket in a Wolff lamp; the mine is a new one and quite wet, but the workings showed some gas; the explosion was heavy and was followed by numerous falls.) 10c.

Earthquake Strains and Stresses in Relation to Colliery Explosions. F. N. Denison. "Min. Sci. "vol. 66.. 1695. pp. 40-1. 1 tab. 40c.

XIV—DRAINAGE, PUMPING, ETC.

Pumping Plant in the Sloss-Pits. (Pumpenanlage in den Sloss-Gruben.) "Kraftmasch. -Bau." 1912. 7. pp. 105-7. 1 fig. 1 ill. (Description of a modern generating plant, the sole purpose of which is the electric drainage of a pit.) 50c.

Shaft-Sinking Pump; Output 6 cubic meter. (300 m.height). (Abteufpumpe. Leistung 6 cbm. auf 300 m.) "Forder. technik." 1912. 5. pp. 106-7; 2 fig. 1 ill. (Description of pump built by the Maffei-Schwartzkopff Works, Berlin.) 60c.

XV—PREPARATION

Washery Plant Control. G. R. Delamater. "Coal Age." vol. 2. 3. pp. 82-3; 1 fig. (By selecting a fluid of correct specific gravity, and dropping a sample of the waste from the washer into it, coal having less than the predetermined impurities floats and shows the proportion of purer coal in the sample.) 10c.

XVI—BRIQUETTES

German Lignite and Briquette Industry. "Iron Coal Tr. Rev." vol. 85. 2317. p. 132. (The German Lignite production amounted to 73,500,000 tons in 1911, being 4,000,000 tons more than in 1910. It is becoming an increasing competitor to coal; and the working is being cheapened by improved machinery.) 30c.

The Causes of Spontaneous Ignition of Briquettes. (Die Ursachen der Brikettseibstentzundung.) Hempel. "Seteinu. Braunkohle." 1912. 11. pp. 128-9. (Ignition experiments with briquette piles carried out by the imperial testing station.) 35c.

Briquetting-Presses with Fly-Wheels. (Brikettpressen mit einem Schwungrade.) E. Frerichs. "Braunkohle" vol. 11. 3. 19 April. pp. 35-40. 1 ill. 4 fig. (Disadvantages of flywheels, lack of data of working results.) 20c.

XVII—COKE OVENS

A new Direct Byproduct Process. "Coal Age." vol. 2. 3. pp. 77-9. 1 fig. (A description of the Simon-Carves direct byproduct recovery process, which takes advantage of the high specific gravity of the coal tars, which are separated by a rapid centrifugal action.) 10c.

Byproduct Coke Ovens. W. E. Hartman. "Proc. Eng. Soc. W. Pa." vol. 28. 4. pp. 311-57. 8 tab.

Byproduct Ovens, Johnstons, Penn. R. D. Hall, "Coal Age." vol. 2. 3. pp. 72-7. 11 fig. 1 tab. (The operating details of the Cambria Steel Co.'s plant of Otto-Hoffman coke oven.) 10c.

The Kros Regenerative Coke Oven. A. Gobiet. "Coal Age." vol. 2. 3. pp. 84-5. 3 fig. (The Kros design maintains a constant temperature in the oven walls, draft reversal is eliminated except in the regenerators, and constant gas and air pressures are obtained by equalizing chambers.) 10c.

Notes on Starting and Stopping Byproducts Recovery Coke-Oven Plant. (Note sur la mise en service et l'arret des fours a coke a recuperation des sous-produits. Rene Gillon. "Rev. Univ. Mines." 1912. vol. 38. 1. pp. 106-16. (Working without recovery by byproducts; connecting up with recovery plant, stoppages, disconnecting.)

What System of Coke-Ovens is most Suitable for Sweden for the Production of Best Blast-Furnace Coke? (Hvieket koksugnssystem ar lampligast for framstallande i Sverige af prima masugnkoks) G. H. Hultmann. "Vermlandska bergamannafor. Annaler." 1911. pp. 31-51. 6 fig. 80c.

XVIII—FUEL TESTING

Further Notes on Coal Impurities. W. B. Phillips. "Coal Age." vol. 2. 4. pp. 111-12. (A readjustment of present methods of writing coal specifications is advocated.) 10c.

So-called "Lower" Calorific Value of Fuels. (Calculated from the results of the Mahler-Bomb test and of direct analysis.) R. Lucion. (Puissance calorifique dite "inferieure" des combustibles. (Calcule d'apres les resultants de l'essai a l'obus de Mahler et ceux de l'analyse immediate.) "Bul. Soc. Chem Belgique." vol. 26. 5. p. 255. $7.00.

Spitzbergen Coal. W. H. Patterson. "Chem. News." vol. 105. 2742. pp. 277. (Analysis and determination of calorific value.) 75c.

Spontaneous Combustion of Coal Cargoes. J. T. Milton. "Colliery Guard." vol. 104. 2691. pp. 175-6. 75c.

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On the Utilization of Storage Waste. (Uber Verwertung von Lagerabfallen.) "D. Kohlenztg." 1912. 6. p. 62. (Utilization of small coke in brickworks for the manufacture of porous bricks; application of anthracite-powder for coal-dust furnaces, etc.) 40c.

Commercial Utilization of Peat for Power Purposes. H. V. Pegg. "Colliery Guard." vol. 104. 2693. pp. 282-3. 3 fig. 75c.

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The End of the Smoke-Stack through the "Schwabach System." (Das Ende des Schornsteins durch das "Schwabachsche System") E. O. Rausser. "Steinu. Braunkohle." 1912. 11. pp. 127-8. 35c.

Coal and Ash Handling at Sioux City. "Power" vol. 36. 2. pp. 28-9. 6 fig. (A complete system which also saves the small coal which drops through the grate and returns it with the raw coal to the furnace.) 5c.

XX—ELECTRICITY

Electric Mining Applications. E. A. Lof. "Schl. Min. Columb. Qr." vol. 33. 4. pp. 317-39. 10 fig. 50c.

Electricity in Mines. (L'Electricite dans les mines.) H. Marchand. "Electricien." vol. 43. 1119. pp. 353-6. 3 ill; 1120. pp. 378-82. 4 ill. (Advantages of electricity. Electric locomotives, ventilators and compressors. Electric drills. Signalling and communication devices.) 25c.

Clifton Colliery Plant. "Iron Coal Tr. Rev." vol. 85. 2317. pp. 129-30. 4 fig. (The distribution of the electrical energy employed at Clifton colliery, Nottingham.) 30c.

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